

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

77 W. JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604-3590

US EPA RECORDS CENTER REGION 5



495094

MEMORANDUM

SUBJECT: ENFORCEMENT ACTION MEMORANDUM – Request for Approval of Action Memorandum for Non-Time Critical Removal Action at Segments 4 & 5 of the Tittabawassee River, Saginaw River & Bay Site, Michigan (Site ID #B5KF)

FROM: Mary P. Logan, Remedial Project Manager *MPL*

THRU: Scott Hansen, Acting Chief *SKH*
Remedial Response Section 5

Joan Tanaka, Chief
Remedial Response Branch 1

Jason H. El-Zein, Chief
Emergency Response Branch 1

TO: Margaret M. Guerriero, Acting Director
Superfund Division

I. PURPOSE

The purpose of this memorandum is to request approval of this Action Memorandum for a Non-Time Critical Removal Action (NTCRA) to address contaminated in-channel sediment and riverbank soil within Segments 4 & 5 of the Tittabawassee River, Saginaw River & Bay site, Michigan. For the purposes of this Action Memorandum, "Site" or "Segments 4 & 5" shall mean the stretch of the Tittabawassee River beginning approximately 11.5 miles downstream of the confluence with the Chippewa River at the upstream end of Reach BB, and extending approximately 6.1 miles through the downstream end of Reach MM, and nearby areas required to perform the Work, as defined in Section V below. The general location of Segments 4 & 5 is depicted in Attachment A to this Action Memorandum.

This NTCRA will mitigate actual or potential threats to public health, welfare, or the environment presented by the presence of an uncontrolled release or threat of release of hazardous substances, pollutants, or contaminants, as identified by the presence of elevated levels of polychlorinated dibenzo-p-dioxins (dioxins) and/or polychlorinated dibenzofurans (furans) from in-channel sediment deposits and riverbanks in Segments 4 & 5 that are actual or potential contaminant sources to the river system. More specifically, the Site poses a risk due to high levels of hazardous substances or pollutants or contaminants in sediment and riverbank soil largely at or near the surface that may migrate; weather conditions that may cause hazardous

substances or pollutants or contaminants to migrate or be released (*i.e.*, periodic flooding events); exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; and actual or potential contamination of sensitive ecosystems. Hazardous substances or pollutants or contaminants have or may have come to be located at Segments 4 & 5 from The Dow Chemical Company (Dow) Midland Plant property, with an address of 1000 East Main Street, 1790 Building, Midland, Michigan, 48667.

Work under this Action Memorandum will generally occur at particular areas within the Site designated as Sediment Management Areas (SMAs) and Bank Management Areas (BMAs). The SMAs and BMAs contain elevated levels of dioxin (primarily furans). The term "dioxin" refers to a large family of similar chemicals, including furans. The United States Environmental Protection Agency (U.S. EPA) has concluded that dioxin may cause cancer or other human health effects such as skin problems, liver damage, and reproductive issues, depending on exposures. Dioxin is not created intentionally; in this case, dioxin formed as a byproduct of Dow's early manufacturing processes. This Action Memorandum discusses dioxin concentrations as the toxic equivalence quotient (TEQ) – a summed estimate of the relative toxicity of the congeners as compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

The proposed response actions include a combination of the following approaches at SMAs 5-1 and 5-2: dredging/removal and disposal of targeted sediment (SMA 5-1 only); in-situ capping; monitored natural recovery (MNR); institutional controls in areas where U.S. EPA determines they are needed; and post-construction operation, monitoring, and maintenance. The proposed response actions include the following approaches at BMAs 4-1 through 4-7 and 5-1 through 5-10: riverbank stabilization; disposal of any material generated as a result of stabilization; institutional controls; and post-construction operation, monitoring, and maintenance.

U.S. EPA and Dow have agreed to enter into an Administrative Settlement Agreement and Order on Consent (Segments 4 & 5 AOC), pursuant to which Dow will perform the removal action described herein with U.S. EPA oversight. The Segments 4 & 5 AOC contains provisions whereby U.S. EPA and Dow agree that additional Segments 4 & 5 SMAs and/or BMAs can be designated by U.S. EPA and added to the Site cleanup plan by future amendment to this Action Memorandum and the Segments 4 & 5 AOC. U.S. EPA, in consultation with the Michigan Department of Environmental Quality (MDEQ), may identify additional Segments 4 & 5 SMAs and/or BMAs based on ongoing monitoring, post-construction risk assessments, or other information. If U.S. EPA identifies any such additional SMAs and/or BMAs, U.S. EPA will amend this Action Memorandum, and U.S. EPA and Dow will amend the Segments 4 & 5 AOC. The Segments 4 & 5 SMAs and BMAs identified as of the signature of this Action Memorandum are depicted in Attachment B.

This action will be conducted in accordance with Section 104(a)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9604(a)(1), and 40 C.F.R. § 300.415 (*Removal Action*) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to abate or eliminate the threats posed to public health and/or the environment. U.S. EPA has consulted, and will continue to consult, with MDEQ regarding Segments 4 & 5. This action is anticipated to require two construction seasons to implement, and is expected to begin in 2017. This action will be implemented by Dow, the potentially

responsible party, under a CERCLA Section 106/122 agreement. As such, pursuant to NCP Section 300.415(k)(3), the requirements to terminate response after \$2 million has been obligated or 12 months have elapsed from the date of the initial response do not apply.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS ID#: MID980994354

Category: Non-Time Critical Removal Action

A. Physical Location and Description

Segments 4 & 5 are the fourth and fifth of seven Tittabawassee River segments that U.S. EPA has designated. The Tittabawassee River, Saginaw River & Bay site starts at the Tittabawassee and Chippewa confluence, at a local landmark, the Tridge. Moving from upstream to downstream: Segment 1 consists of a 3.1 mile stretch of the Tittabawassee River that transects the Dow Midland plant; Segment 2 is about 4.1 miles long; and Segment 3 is about 4.2 miles long. Segments 4 & 5 begin approximately 11.5 miles downstream of the Tridge. Segment 4 begins at the upstream end of Reach BB¹ and extends approximately 3.4 miles through the middle of Reach II. Segment 5 extends approximately 2.7 miles through the downstream end of Reach MM.

Land use on both sides of Segments 4 & 5 consists of residential, agricultural, recreational, and undeveloped land. Segment 4 is located within the Tittabawassee, Thomas, and Saginaw Townships of Saginaw County. Segment 5 is located within Thomas and Saginaw Townships of Saginaw County. Physical features in Segments 4 & 5 include the Tittabawassee Road Bridge at the Reach DD/EE boundary, Imerman Park on the northwest side of mid-Reach II through Reach LL, and State Road Bridge at the downstream boundary of Segment 5. Tributaries enter Segments 4 and 5 on the northeast sides of Reaches FF and II, and on the southwest side of Reach MM. The channel sinuosity in Segments 4 & 5 is characterized as higher than other areas of the river. The hydraulic gradient in Segments 4 & 5 is generally less than 1 foot per mile.

Human access to the Site is available to people using the Tittabawassee River, from the park, or across privately owned riverside properties. Wildlife in the area also has access to the Site. Segments 4 & 5 are subject to periodic flooding during high flow events. This may result in erosion at the SMAs and/or BMAs and the spread of contamination to downstream locations, including floodplains, where the contamination may become available for exposure elsewhere.

The Tittabawassee River, Saginaw River & Bay site, is defined in the Administrative Settlement Agreement and Order on Consent for Remedial Investigation, Feasibility Study and/or Engineering Evaluation and Cost Analysis, and Response Design, entered In The Matter of: The Dow Chemical Company, CERCLA Docket No. V-W-10-C-942, with an effective date of January 21, 2010 (2010 AOC). The site is the area located in and along the Tittabawassee River

¹ River reaches refer to shorter sections of the Tittabawassee River than segments. Reaches were delineated as part of the geomorphological characterization of the river. Reaches begin with Reach A at the upstream end of Segment 1 and end in Reach YY at the downstream end of Segment 7.

and its floodplains, starting upstream of the Midland Plant, and extending downstream to, and including, the Saginaw River and its floodplains, and Saginaw Bay; and any other areas in or proximate to the Tittabawassee River and its floodplains, the Saginaw River and its floodplains, and Saginaw Bay, where hazardous substances, pollutants, or contaminants from the Midland Plant have or may have come to be located.

B. Background

The Midland Plant began operations in 1897 and eventually grew to be a 1,900 acre facility. One major historical process used at the Midland Plant was the chloralkali process, which used electric current to extract chemicals from brine. Over the time of its operation, the Midland Plant has produced over 1,000 different organic and inorganic chemicals. These chemicals include the manufacture of 24 chlorophenolic compounds since the 1930s.

Earlier in the history of the Midland Plant, wastes were discharged directly into the Tittabawassee River and, sometime later, wastes were stored and partially treated in settling ponds prior to discharge to the River. Historically, flooding of the Midland Plant property may have resulted in discharges of stored brines and untreated or partially treated process wastewaters to the Tittabawassee River. Much of the Segments 4 & 5 TEQ contamination is believed to have been released in the early 1900s in the form of furan-contaminated graphitic particles that came from breakdown of the carbon anodes used in the chloralkali process. Once released to the River, the graphitic particles mixed with the sediment and deposited in levees that form the riverbanks. Frequent flooding resulted in deposition of contaminated sediment in the floodplain. Over time, changes in waste management practices included the installation and operation of a modern wastewater treatment plant. Changes in the wastewater treatment plant and subsequent incorporation of pollution controls into both the operations of, and emissions from, the incinerators reduced or eliminated non-permitted releases and emissions from the Midland Plant.

Dioxins and furans are listed as hazardous constituents in Appendix VIII to Part 261 of Title 40 of the Code of Federal Regulations, 40 C.F.R. Part 261 app. VIII, and Part 111 of Natural Resources and Environmental Protection Act (NREPA), Mich. Comp. Laws §§ 324.11101-324.11153, and as hazardous substances in Part 201 of NREPA, Mich. Comp. Laws §§ 324.20101-324.20142.

MDEQ reissued to Dow its current Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Operating License for the Midland Plant, with an effective date of September 25, 2015 (License). Under its License, and the previous licenses, Dow has been conducting corrective action work including characterization of the Tittabawassee River. Dow continues to conduct corrective action work under the License on the plant site and off-site in the City of Midland. Corrective action work also is identified in the January 19, 2005, Framework for an Agreement between the State of Michigan and the Dow Chemical Company.

U.S. EPA's and MDEQ's understanding of potential hazardous substances in sediment and riverbank soil at Segments 4 & 5 is based on various sampling, analysis, and studies regarding dioxin/furans and other contaminants in the Tittabawassee River, the Saginaw River, and the Saginaw Bay. The sampling, analysis, studies, and orders relied on by U.S. EPA and MDEQ

include, but are not limited to, those listed in the Administrative Record index found herein as Attachment C.

In December 2008, negotiations with Dow began for a more comprehensive approach to addressing contamination related to Dow in the rivers and Bay. On January 14, 2010, using CERCLA authority, U.S. EPA signed the 2010 AOC with the MDEQ and Dow, requiring Dow to perform investigations, and develop and design cleanup options selected by U.S. EPA for areas such as Segments 4 & 5, and other areas. The 2010 AOC became effective on January 21, 2010, and work under the 2010 AOC is ongoing.

The 2010 AOC established a comprehensive site-wide management approach for the Tittabawassee River, Saginaw River & Bay site. This Segments 4 & 5 Action Memorandum is part of the larger site-wide management plan. U.S. EPA's focus in these segments is cleanup of in-channel sediment and riverbank soil. Cleanup of the Tittabawassee River floodplain is being addressed separately and in parallel with the River segments, pursuant to a 2015 floodplain NTCRA. The site-wide management approach includes developing a set of prioritized actions (including this Segments 4 & 5 NTCRA) intended to reduce exposure to and transport of contaminated sediment, riverbanks and floodplain soil to reduce risks to human health and ecological receptors. Subsequent to implementation of current and potential future NTCRAs, U.S. EPA will evaluate residual human health and ecological risk, informed by the long-term monitoring plan conducted for actions in Operable Unit 1 (OU 1) of the site, which includes the segments in the Tittabawassee River and upper Saginaw River, to assess the need for further cleanup actions at OU 1. Subsequently, a final Record of Decision(s) will be issued for Operable Unit 1 (OU 1).

C. Environmental Justice Analysis

An Environmental Justice (EJ) analysis for the Site is contained in Attachment D. Screening of the surrounding area used U.S. EPA's EJSCREEN Tool (see <https://www.epa.gov/ejscreen>). Region 5 reviewed environmental and demographic data for the area surrounding Segments 4 & 5, and determined there is a low potential for EJ concerns at this location.

D. Risk Assessments, Health Consultations, and Advisories

1. Risk Assessments

Dow, under U.S. EPA and MDEQ oversight, collected extensive data at the Tittabawassee River, Saginaw River & Bay site. The 2010 AOC and associated Statement of Work (2010 SOW) set forth requirements that Dow conduct human health and ecological risk assessments. Dow has not yet completed those risk assessments but will conduct them in accordance with the requirements and schedule of the 2010 SOW. In particular, to assess residual risks for OU 1 (including Segments 4 & 5), Dow will conduct the risk assessments after substantial implementation of response actions. U.S. EPA currently anticipates completion of the post-construction risk assessments for some portions of OU 1 before cleanups of all seven of the Tittabawassee River segments are complete.

The *Tittabawassee River Segments 4 and 5 (OU 1) Response Proposal* (Segments 4 & 5 EE/CA), dated May 31, 2016, and approved by U.S. EPA with modifications on August 29, 2016, presented detailed information obtained during a series of site investigations conducted by Dow. A brief summary of the findings is included in Section II.E, below. These investigations largely focused on dioxins and furans, but also characterized a sub-set of samples for a wide range of other contaminants in Segments 4 & 5 sediment and riverbank soil.

The Segments 4 & 5 EE/CA presented the conceptual site model and evaluated the bases for these current response actions. Neither a human health nor an ecological risk assessment was conducted as part of the Segments 4 & 5 EE/CA, but conditions were evaluated compared to NCP removal criteria (§ 300.415(b)(2)). The SMAs and BMAs are actual or potential contaminant sources to the system. Mitigating these sources will contribute to lower TEQ surface sediment levels that, over time, will contribute to lower fish tissue levels and lower TEQ levels in sediment deposited in the floodplain. Because clean materials continually move into the site from upstream, U.S. EPA expects that natural processes to reduce TEQ levels throughout the Tittabawassee River, Saginaw River & Bay site can occur after upstream source control actions are implemented.

Dow, under Agency oversight, is conducting trend monitoring of fish tissue and surface sediment TEQ levels to help assess site-wide changes over time. As discussed above, risk assessments that evaluate post-construction conditions will be conducted in the future, pursuant to the 2010 SOW, subsequent to early actions taken on the River.

2. Health Consultations

EPA and MDEQ work with health agencies such as the Agency for Toxic Substances and Disease Registry (ATSDR) and Michigan Department of Community Health (MDCH) to understand potential health effects to people from environmental contamination. ATSDR and MDCH completed a number of health consultations for the Tittabawassee River, Saginaw River & Bay site, including:

- 8/12/04 Health Consultation, Tittabawassee River Floodplain Dioxin Contamination, Tittabawassee River, Midland, Midland County, Michigan
- 4/29/05 Petitioned Health Consultation, Dioxins in Wild Game Taken from the Tittabawassee River Floodplain South of Midland, Midland and Saginaw Counties, Michigan
- 7/27/05 Tittabawassee River Fish Consumption Health Consultation, Tittabawassee River, Midland, Midland County, Michigan
- 11/1/07 A Pilot Exposure Investigation Report: Dioxin Exposure in Adults Living in the Tittabawassee River Floodplain
- 2/4/08 Health Consultation, Evaluation of Saginaw River Dioxin Exposures and Health Risks, Saginaw River, City of Saginaw, Saginaw County, Michigan
- 8/19/09 Health Consultation, Dioxin Contamination on Residential Property in the Tittabawassee River Floodplain, Saginaw County, Michigan

All of the health consultations listed above can be found at <http://www.atsdr.cdc.gov/HAC/PHA/HCPHA.asp?State=MI>.

3. Advisories

The State of Michigan has issued fish consumption advisories for dioxins, PCBs, and mercury for the Tittabawassee and Saginaw Rivers and Saginaw Bay. These advisories are posted at multiple locations throughout the watershed. The advisories can be found online at http://www.michigan.gov/documents/mdch/EAT_SAFE_FISH_IN_THE_SAGINAW_BAY_AREA_WEB_356929_7.pdf

The State of Michigan has issued a public Health Advisory for Consuming Wild Game from the Tittabawassee River Flood Plain due to dioxin contamination. The wild game advisory can be found online at http://www.michigan.gov/documents/mdch/Eat_Safe_Wild_Game_277942_7.pdf

The State of Michigan's latest advisories are summarized in *Dioxins and Furans and Your Health along the Tittabawassee and Saginaw Rivers*. This brochure is found at http://www.michigan.gov/documents/mdch/Dioxin_Exposure_and_Health_Final_420292_7.pdf

E. Site Assessments

The Administrative Record for the Site contains numerous reports which summarize the investigations conducted at the Tittabawassee River, Saginaw River & Bay site to date. Assessments include chemical and geophysical sampling and analysis, stability evaluations, and biological evaluations. Segments 4 & 5 chemical assessment activities include extensive work: in 2007 and 2008 as part of the Tittabawassee River Site Investigation; in 2010 to 2012 as part of the bank face composite TEQ sampling program; in 2014 for additional bank core TEQ sampling; in 2014, 2015, and 2016 as part of the in-channel composite TEQ testing; and in 2015 as part of additional step-out sediment sampling. For in-channel sediment in Segments 4 & 5, Dow completed dioxin analysis on more than 2,400 samples from more than 340 core locations. Additionally, Dow collected 25 quarter-mile incremental composite surface sediment grab samples to assess the average concentrations. For Segments 4 & 5 bank soil, Dow completed dioxin analysis on more than 780 samples from about 190 core locations. Dow also sampled for more than 220 other chemicals or chemical families at a subset of the riverbank soil and sediment core locations.

The Segments 4 & 5 EE/CA built upon the documents in the Administrative Record. The Segments 4 & 5 EE/CA identified certain areas within the Site, designated as SMAs and BMAs, for which response alternatives were developed. Existing analytical data indicates the following conditions. Dioxins (primarily furans) are the contaminants of concern in Segments 4 & 5 addressed by this Action Memorandum. The SMAs were identified primarily by depositional geomorphic features (e.g., point bars) with contiguous deposits of elevated TEQ. Both lateral and vertical extent of the contamination was considered, including distance to neighboring cores. The BMAs were identified by two primary criteria – low stability, based on multiple lines of evidence, and higher relative levels of TEQ. There are multiple sample cores in and adjacent to each SMA and BMA. In six BMAs the cores with the highest levels of dioxin had a length weighted average (LWA) exceeding 10,000 ppt TEQ. The cores with the highest levels of

dioxin in the other BMAs generally had LWAs between 5,000 to 10,000 ppt TEQ. In both SMA 5-1 and 5-2 there are several cores with LWA dioxin levels exceeding 10,000 ppt TEQ. The maximum individual samples were 16,000 ppt at SMA 5-1 and 23,000 ppt at SMA 5-2

F. NPL Listing Status

Neither the Tittabawassee River, Saginaw River & Bay site nor Segments 4 & 5 are listed on the National Priorities List (NPL).

U.S. EPA is addressing the Tittabawassee River, Saginaw River & Bay site under the Superfund Alternative (SA) approach, which uses the same investigation and cleanup process and standards for sites listed on the NPL. The SA approach is an alternative to listing a site on the NPL; it is not an alternative to Superfund or the Superfund process. Threshold eligibility criteria for using the SA approach are: site contaminants are significant enough that the site would be eligible for listing on the NPL (*i.e.*, the site would have a Hazard Ranking Score ≥ 28.5); a long-term response (*i.e.*, a remedial action) is anticipated at the site; and there is a willing, capable PRP who will negotiate and sign an agreement with EPA to perform the investigation and cleanup.

G. Maps, Pictures and Other Graphic Representations

A figure showing the general location of Segments 4 & 5 is included as Attachment A to this Action Memorandum. The BMAs and SMAs within Segments 4 & 5 where removal response actions are required as of the effective date of this Action Memorandum are depicted in the table and on the figures in Attachment B.

H. Other Actions to Date

1. Previous CERCLA Actions at Tittabawassee River, Saginaw River & Bay Site

In order to implement response actions at the Tittabawassee River, Saginaw River & Bay site, U.S. EPA and Dow have entered into numerous separate AOCs under the authority of Sections 104, 106(a), 107, and 122 of CERCLA.

- a. On July 12, 2007, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal to dredge and dispose of a sediment deposit at Reach D adjacent to Dow's Midland plant. U.S. EPA provided Dow with notification of the completion of this AOC on October 15, 2008.
- b. On July 12, 2007, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal at Reaches J/K to remove and dispose of contaminated riverbank soil, cap a contaminated upland area, and fence off a contaminated wetland area. U.S. EPA provided Dow with notification of the completion of this AOC on May 2, 2008.
- c. On July 12, 2007, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal to dredge and dispose of a sediment deposit at Reach O. U.S.

EPA provided Dow with notification of the completion of this AOC on April 10, 2008.

- d. On November 15, 2007, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal to dredge and dispose of a sediment deposit near Wickes Park in the Saginaw River. U.S. EPA provided Dow with notification of the completion of this AOC on August 4, 2008.
- e. On July 15, 2008, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal to remove and dispose of floodplain soil around residential properties at Riverside Boulevard and clean the inside of occupied homes. U.S. EPA provided Dow with notification of the completion of this AOC on February 1, 2010.
- f. On February 27, 2009, U.S. EPA and Dow entered into an AOC for a CERCLA time critical removal to remove and dispose of floodplain soil at West Michigan Park and conduct soil removal and/or barrier controls at adjacent residential properties. U.S. EPA provided Dow with notification of the completion of this AOC on September 11, 2012.
- g. On May 26, 2011, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to provide interim exposure controls at eligible floodplain properties. The work under this AOC is ongoing.
- h. On July 8, 2011, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to remove a small eroding island and cap adjacent sediment in Reach MM. U.S. EPA provided Dow with notification of the completion of this AOC on July 12, 2012.
- i. On November 1, 2011, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to remove and destroy dense non-aqueous phase liquids from the Tittabawassee River and install hydraulic control barriers and caps at SMAS in Segment 1. The work under this AOC is ongoing.
- j. On November 21, 2013, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to address SMAs and BMAs within Segment 2. The work under this AOC is ongoing.
- k. On January 8, 2015, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to address soil contaminated with dioxins and furans within the Tittabawassee River 8-year floodplain of the Tittabawassee River, Saginaw River & Bay site. The work under this AOC is ongoing.
- l. On February 25, 2016, U.S. EPA and Dow entered into an AOC for a CERCLA non-time critical removal action to address SMAs and BMAs within Segment 3. The work under this AOC is ongoing.

The AOCs listed above in g, i, j, k, and l are current actions and are further described in Section II.H.3 in this Action Memorandum.

2. Previous Actions Within Segments 4 & 5

The CERCLA NTCRA discussed above in Section II.H.1.h occurred within Segment 5. In 2011, Dow removed an in-channel island in Reach MM. Dow removed the accreted island sediment and woody debris and disposed of the material off site. The remaining sediments in the vicinity of the Reach MM Island that contained or may have potentially contained elevated TEQ levels were confined in-place with an armor cap of approximately 1 foot of natural aggregate across a surface area of approximately 8,700 square ft. Following cap placement, the island was reconstructed to promote natural habitat recolonization.

3. Current Actions

Dow, under U.S. EPA and MDEQ oversight, is addressing potential acute or near-term exposure risks at eligible properties in the floodplain through interim exposure controls pursuant to the May 26, 2011, AOC. Dow placed interim exposure controls at many floodplain properties, primarily in 2011 and 2012. As the floodplain work discussed below (January 8, 2015, AOC) is being implemented, the need for interim exposure controls at eligible properties is being superseded. However, this AOC remains open until floodplain obligations are met.

Response options are generally developed and implemented in an upstream-to-downstream, segment-by-segment fashion for in-channel sediment and riverbanks. Pursuant to the November 1, 2011, AOC, Dow's cleanup of SMAs in Segment 1 started in 2012 and was largely complete in 2013. Dow is continuing to remove DNAPL from one Segment 1 SMA. Pursuant to the November 21, 2013, AOC, cleanup of SMAs and BMAs in Segment 2 started in 2014 and construction of the remaining BMA work was largely complete in 2015. Pursuant to the February 25, 2016, AOC, cleanup of SMAs and BMAs in Segment 3 started and was largely complete in 2016. The work required by these NTCRAs is ongoing, ensuring the native vegetation planted on the BMAs is well established, and post-removal site controls are developed and implemented.

Dow, with oversight by U.S. EPA and MDEQ, is cleaning up dioxin-contaminated soil in frequently flooded areas along the Tittabawassee River pursuant to the January 8, 2015, AOC. The floodplain includes about 4,500 acres and extends along 21 miles of the river below Dow's Midland plant. The plan has a combination of cleanup approaches – generally, excavation and disposal of contaminated soil, with an option to cover the contaminated soil with clean material, if EPA approves. Not all areas in the floodplain will need a cleanup. U.S. EPA is assessing more than 700 properties to determine if a cleanup is needed and the most appropriate option to use. Dow began cleanup of the first floodplain properties in the summer of 2015, and floodplain cleanup is an ongoing, multi-year project. To date, only the excavation and disposal option has been used, and all cleanups have been in maintained residential areas.

I. State, Tribal, and Local Authorities' Role

1. State and Local Actions to Date

Dow's current License for the Midland Plant was reissued by MDEQ with an effective date of September 25, 2015. Under its License and the January 19, 2005, Framework for an Agreement between the State of Michigan and The Dow Chemical Company, Dow conducted corrective action work including characterization of the Tittabawassee River and implementation of interim response actions. U.S. EPA has partnered with MDEQ, as described under the 2010 AOC, to continue to undertake CERCLA activities at the Tittabawassee River, Saginaw River & Bay site. The CERCLA actions are intended to also meet Dow's RCRA corrective action requirements for the Tittabawassee River, Saginaw River & Bay site.

2. Potential for Continued State/Local Response

U.S. EPA anticipates a continuing partnership with MDEQ as outlined in the 2010 AOC. Three of the Segment 5 BMAs are in Imerman Park, so U.S. EPA has worked, and will continue to work closely with the Saginaw County Parks and Recreation Commission.

3. Tribal Role

U.S. EPA asked the Saginaw Chippewa Indian Tribe of Michigan (SCIT) if it wanted a formal a government-to-government consultation prior to U.S. EPA's issuance of the proposed cleanup plan for Segments 4 & 5. The SCIT did not request a formal consultation, but U.S. EPA conducted informal coordination. Prior to the Segments 4 & 5 proposal, U.S. EPA provided the draft proposed plan fact sheet and summary information to the SCIT. U.S. EPA and the SCIT had an informal discussion about the proposed Segments 4 & 5 remedy. Additionally, Dow and U.S. EPA gave members of the SCIT a boat tour to see the ongoing work in Segment 3 and to discuss Segments 4 & 5, which are very similar to Segment 3. U.S. EPA will continue to work with the SCIT on a government-to-government basis.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

The conditions present at Segments 4 & 5 constitute a threat to public health, welfare, or the environment based upon the factors set forth in the NCP, 40 C.F.R. § 300.415(b)(2). These factors include, but are not limited to, the following:

A. High levels of hazardous substances or pollutants or contaminants in sediment and soil largely at or near the surface that may migrate.

This factor is present at the Site due to the existence of elevated TEQ at or near the surface of in-channel sediment deposits and in riverbank stretches with low stability. The Site is subject to periodic high energy events. This may result in the spread of contaminated sediment and soil to other downstream locations within the floodplain and river channel.

B. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

This factor is present at the Site due to seasonal and often extreme weather conditions in the winter and spring (although high flow events can occur at any time of year), which enhance the threat of movement of contaminated sediment and riverbank soil. Heavy rain and storms increase stream volume and current velocity, which can contribute to movement of contaminated sediment and riverbank soil.

C. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants or contaminants.

This factor is present at the Site due to the existence of surface sediment contaminated at levels that may contribute to bioaccumulation of TEQ in the food chain (fish tissue) and may result in the spread of contaminated sediment and soil to other downstream locations within the floodplain and river channel where exposure may occur.

D. Actual or potential contamination of sensitive ecosystems.

This factor may be present at the Site if high levels of surface sediment contamination spread to sensitive floodplain ecosystems.

IV. ENDANGERMENT DETERMINATION

Given the conditions at Segments 4 & 5, the nature of the hazardous substance there, and the potential exposure pathways described above, the actual or threatened release of contaminants from Segments 4 & 5, if not addressed by implementing the response actions selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED REMOVAL ACTION ACTIVITIES AND ESTIMATED COSTS

A. Proposed Removal Action Activities

1. Proposed Removal Action Description

The required response actions at Segments 4 & 5 will, at a minimum, include the following tasks (collectively, the Work):

Develop and implement a Work Plan. The actions described in the approved Work Plan and all approved designs shall generally include, but are not limited to, the following:

- a. Conduct pre-removal field investigations to delineate the final footprints and inform the design of the SMAs and BMAs.

- b. Develop temporary staging areas and access to the Site to meet project requirements. Such areas may include, but are not limited to, equipment decontamination, dewatering, mobilization and demobilization, worker access, and exclusion zones.
- c. Design the following response actions. Upon approval of the design(s), implement the response actions in accordance with the approved schedule.
 - i. SMA 5-1 – Use a combination of technologies that include: dredging or excavation; in-situ capping and MNR.
 - ii. SMA 5-2 – Construct an in-situ containment cap.
 - iii. BMAs 4-1 through 4-7 and 5-1 through 5-10 – Stabilize the riverbanks.
- d. Dispose of materials removed from the Site as a result of implementing the Work at approved locations. Dewater as necessary, transport, and dispose of all sediment removed from the Site. Manage water removed from the sediment in accordance with the Work Plan.
- e. Conduct monitoring during the construction phase of the Work.
- f. Remove and restore the mobilization and staging areas.

Develop and implement a Site Health and Safety Plan.

Develop and implement a Post-Removal Site Control Plan which shall include provisions for periodic monitoring of the Site and maintenance (operation and maintenance), as necessary. For areas where U.S. EPA determines that institutional controls are needed, the plan shall also include an Institutional Control Implementation and Assurance Plan.

2. Contribution to Remedial Performance

The removal action implemented at Segments 4 & 5 will address actual or potential short-term and/or long-term risks by reducing exposure to and/or transport of contaminated sediment and/or riverbank soil. In accordance with Section 300.415(d) of the NCP, U.S. EPA expects that this removal action shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned.

3. Analysis of Selected Response Actions

U.S. EPA selected the proposed response actions in this NTCRA based on careful consideration of multiple factors, including the EE/CA Approval Memorandum, the Segments 4 & 5 EE/CA, public comments as evaluated in the Responsiveness Summary found at Attachment E, and other information in the Administrative Record.

U.S. EPA guidance establishes criteria for the evaluation of removal responses. Therefore, U.S. EPA evaluated the response actions in this NTCRA relative to effectiveness, implementability, and cost. Additionally, as required by the 2010 AOC, the Segments 4 & 5 EE/CA further

evaluated the potential response alternatives against the nine evaluation criteria established for remedial responses in Section 300.430(e)(9)(iii) of the NCP. The discussion below highlights the most relevant criteria in distinguishing between alternatives. U.S. EPA, in consultation with MDEQ, selected the removal responses discussed above because these options provide the best balance of the evaluation criteria.

a. SMA Alternatives

Effectiveness: The selected SMA alternatives are expected to help protect human health and the environment, meet the cleanup objectives and comply with laws and regulations. The response actions contribute to effectiveness because of:

- *Long-term effectiveness and permanence* – The response actions for each SMA are expected to be effective in the long term.
 - For SMA 5-1, EPA is selecting a combination of removal, capping, and MNR because the area is complex. The middle part of SMA 5-1 has high dioxin levels close to the sediment surface in a stretch with the potential for erosion. Contaminated sediment will be removed here, likely in dry conditions. The water is too deep in the upstream part of the SMA to allow dry removal, so that area will be capped. The adjacent area is thickly wooded, and wet removal could result in substantial impacts on the upland habitat. In some parts of the SMA, several feet of cleaner sediment overlays the high contamination. MNR will be used in these areas to monitor buried contamination and trigger evaluation of additional cleanup, if necessary.
 - For SMA 5-2, EPA is selecting capping, because this area seems to be fairly stable and about a foot of clean sediment already covers the contamination. Capping will ensure long-term isolation and stability of the TEQ deposit. This SMA seems to be ideal for a Cellular Containment System (CCS) cap², which would enhance the sediment stability and habitat, while short-term effects are minimized. The cap will be monitored and may need maintenance to make sure it is reliable in the long term.
 - Construction may require clearing areas that obstruct access to the site. Removal affects a larger nearby work area than capping using sand or gravel, and significantly more area than a CCS cap. SMA 5-1 is adjacent to a mature forest so there would be significant long and short-term effects on the habitat if significant vegetation removal were needed for access. SMA 5-2 is directly adjacent to a BMA. Use of a CCS cap at SMA 5-2 would minimize adverse impacts to the nearby habitat.
- *Short-term effectiveness* – The response action for each SMA may have some short-term effects that would temporarily disrupt areas in and along the river during construction. Short-term effects will be managed by construction practices and post-construction restoration of shoreline work areas. Capping takes less time to complete than removal. Either alternative could result in short-term turbidity in the water. Removal could also result in release of contaminants to surface water and movement of contaminants downstream during construction, especially when the work is performed in wet conditions. If removal is

² A CCS is a capping approach that isolates and contains the underlying contaminated sediment and prevents erosion by promoting natural sedimentation. A six-inch deep geocellular material is placed over the SMA and the geocells quickly fill with sediment bedload moving through the river system. To date, CCS caps have been stable in the Tittabawassee River.

performed in dry conditions, care is needed to prevent erosion in nearby areas. Removal requires truck traffic to take the contaminated sediment to an approved landfill. If capping is done using sand or gravel, there will be truck traffic to deliver the clean cover materials.

Implementability: Dow has successfully implemented the selected SMA alternatives at other areas in the Tittabawassee River. All equipment, personnel and material necessary to implement the alternatives should be locally available.

- Both capping and removal are easier during lower-flow conditions. Typically this work is planned later in the summer, but unexpected high flows can bring challenges. Because of implementation challenges from water depth, it is anticipated that an armor cap will be placed at the upstream portion of SMA 5-1
- There are no anticipated implementation challenges for MNR or other monitoring, other than the need for safe river conditions during monitoring.
- Implementation may be a challenge because of the need for access to the river via privately held land for some construction activities, and access permission will be needed from the landowner. Capping may require access roads and staging areas, particularly for sand and gravel caps. CCS caps provide more flexibility in river access because heavy equipment is not used and the SMAs could be approached by water. Removal requires the greatest degree of site access, including temporary roads and large staging areas for heavy equipment, contaminated sediment staging and transport, and water management equipment.

Cost: The total estimated present worth cost for EPA's selected SMA alternatives ranges from \$1.8 million to \$2.6 million. The range of costs reflects different cap designs and expected cost differences for removal work in dry versus wet conditions.

b. BMA Alternatives

Effectiveness: The selected BMA alternative, stabilization, is expected to help protect human health and the environment, meet the cleanup objectives, and comply with laws and regulations. The design of each BMA will consider current conditions to select appropriate stabilization technologies to enhance effectiveness. The response actions contribute to effectiveness because:

- *Long-term effectiveness and permanence* – Stabilization of the BMAs is expected to be effective in the long term because it ensures that highly contaminated banks do not erode into the river. The alternative requires a long-term plan to monitor and maintain the banks.
- *Short-term effectiveness* – Stabilization takes less time to construct than removal, so there are fewer short-term disruptions in and along the river. However, establishment of the deep rooted native vegetation takes a couple of years, so more short-term maintenance is needed. Stabilization is expected to have less short-term effects on workers and the community; using less heavy construction equipment and requiring less truck traffic. Stabilization causes less change to existing riverbank conditions than removal. With stabilization the riverbank habitat would remain or be improved. Stabilization minimizes removal of mature trees and habitats that may require decades to return to their pre-construction condition.

Implementability: Dow has successfully implemented both of the BMA alternatives along the Tittabawassee River. Necessary personnel and equipment are available for either option. The appropriate stabilization technologies will be applied to each BMA after taking into consideration characteristics such as bank height and angle, existing vegetation quality, the potential for river flows to undercut the banks and other considerations. Extremely high or steep banks may pose challenges for the placement of certain slope stabilization materials, and may require reshaping the banks. Stabilization is implementable for Segments 4 & 5 BMAs because:

- Community members and landowners generally find bank stabilization preferable to bank removal. Access through privately held land is required to implement the BMA cleanups, so landowner acceptance is important.
- The need for staging areas is far less for stabilization than for removal, easing the ability to implement this alternative. Several of the Segments 4 & 5 BMAs are surrounded by dense forests, where access is limited. Stabilization requires less extensive clearing and preparation than removal, to allow equipment access to the bank.

Cost: The total present worth cost for all BMAs is estimated at about \$3.4 million. Stabilization costs about \$52,000 per 100 linear feet of bank, with additional costs associated with access, mobilization, and demobilization at each BMA.

4. Engineering Evaluation/Cost Analysis (EE/CA) and Public Comment

Task 8 of the 2010 SOW sets forth requirements to develop and submit segment-specific response proposals. As it deems appropriate, U.S. EPA, in consultation with MDEQ, may direct the use of U.S. EPA's removal and/or remedial program authorities under CERCLA, and Dow shall submit either a Feasibility Study or an EE/CA consistent with the 2010 SOW requirements.

Based on a review of U.S. EPA's guidance, the NCP, and conditions in Segments 4 & 5, U.S. EPA, in consultation with MDEQ, determined that Dow should submit an EE/CA for Segments 4 & 5. U.S. EPA documented this in an EE/CA Approval Memorandum dated April 21, 2015. Dow submitted the Segments 4 & 5 EE/CA dated May 31, 2016. U.S. EPA, in consultation with MDEQ, approved the Segments 4 & 5 EE/CA with modifications on August 29, 2016 for purposes of public comment.

The Segments 4 & 5 EE/CA included proposed alternatives to address sediment contamination within specific SMAs and soil contamination within specific BMAs within Segments 4 & 5 that are actual or potential contaminant sources to the system. On or before September 14, 2016, U.S. EPA released a fact sheet titled "EPA Proposes Cleanup Plan for Tittabawassee River: Segments 4 & 5." This Fact Sheet described the Segments 4 & 5 EE/CA and U.S. EPA's recommended response actions and sought public comment on the Segments 4 & 5 EE/CA, pursuant to the NCP requirements.

U.S. EPA expected that the public would want more than the normal 30-day public comment period and therefore provided in advance a 15-day extension to the public comment period. The public comment period ran from September 22 through November 6, 2016. U.S. EPA, with participation of MDEQ, held a public meeting regarding the proposed response actions on

October 19, 2016, at the Arrowwood Elementary School, Saginaw, Michigan. U.S. EPA also presented the proposed options to the Saginaw Tittabawassee Rivers Contamination Community Advisory Group (CAG) and a few public attendees on September 19, 2016.

U.S. EPA received written and verbal comments during the public comment period. There was an opportunity to make verbal comments at the public meeting. In total, U.S. EPA received comments from 7 different individuals and the CAG. U.S. EPA carefully evaluated the comments and developed a Responsiveness Summary, found herein as Attachment E. Copies of all the comments received are included in the Administrative Record for Segments 4 & 5.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

In accordance with 40 C.F.R. § 300.415(j), all on-site actions required pursuant to this Action Memorandum shall, to the extent practicable, as determined by U.S. EPA, considering the exigencies of the situation, attain ARARs under federal environmental or state environmental or facility siting laws. In accordance with Section 121(e) of CERCLA, 42 U.S.C. § 6921(e), and 40 C.F.R. § 300.400(e), no federal, state or local permits will be required for on-site response actions conducted as part of this removal action. U.S. EPA, in consultation with MDEQ, reviewed the list of potential ARARs in the Segments 4 & 5 EE/CA, and approved it on August 29, 2016, for purposes of public comment. Following is a summary of potential ARARs and to be considered guidance (TBCs) that were identified in the Segments 4 & 5 EE/CA:

a. Federal

Potential Federal Chemical-Specific Requirements or TBCs

Clean Water Act – Federal Surface Water Quality Standards
Clean Water Act – Federal Ambient Water Quality Criteria

Potential Federal Action-Specific Requirements or TBCs

Clean Water Act – Section 402
Resource Conservation and Recovery Act – Subtitles C and D and Land Disposal Restrictions
Endangered Species Act
Bald and Golden Eagle Protection Act

Potential Federal Location-Specific Requirements or TBCs

Floodplain and Wetland Regulations and Executive Orders 11988 and 11990
Clean Water Act – Sections 303 and 404
Great Lakes Water Quality Initiative
Rivers & Harbors Act
National Historic Preservation Act
Migratory Bird Treaty Act
Archeological and Historic Preservation Act
American Indian Religious Freedom Act
Archeological Resources Protection Act
Native American Graves Protection and Repatriation Act
Fish and Wildlife Coordination Act

b. State

Potential State Chemical-Specific Requirements or TBCs

Michigan Water Quality Standards

Potential State Action-Specific Requirements or TBCs

Michigan Natural Resources and Environmental Protection Act (NREPA) – Part 31

Michigan NREPA – Part 91

Michigan NREPA – Part 111

Michigan NREPA – Part 115

Michigan NREPA – Part 121

Michigan NREPA – Part 201³

Michigan NREPA – Part 365

Michigan NREPA – Part 413

Michigan Administrative Code Rule R 336.1901(a)

Potential State Location-Specific Requirements or TBCs

Michigan NREPA – Part 301

Michigan NREPA – Part 303

B. Project Schedule

Upon the effective date of the Segments 4 & 5 AOC, Dow will start to develop a Work Plan. The Work Plan will contain a specific schedule for implementation of the Work. U.S. EPA anticipates that Work will begin in 2017. This action is anticipated to require two construction seasons to implement (2017 and 2018).

C. Estimated Costs

The estimated cost for the required work at Segments 4 & 5 is about \$5.1 million to \$5.5 million. The range of costs primarily reflects different process options for the SMAs, including cost differences for different cap designs and sediment removal for work in dry versus wet conditions. These estimated costs include labor, equipment, materials used during installation, and operation and maintenance. Monitoring and maintenance costs were estimated for a 30-year time period. The cost estimates were developed based on a review of previous Dow project data, similar projects completed at other sites, initial input from prospective Dow contractors, and an extrapolation by U.S. EPA of unit costs to the expected work scope. Consistent with U.S. EPA guidance, the cost estimates for each alternative are anticipated to be accurate within the range of -30 to +50 percent. A future discount rate of 7 percent was used for the present worth calculations of post-construction monitoring costs, as specified by U.S. EPA guidance.

³ Part 201 of the Michigan Natural Resources and Environmental Protection Act, specifically at Mich. Comp. Laws §§ 324.20107a(1), and 324.20120c(1)(a), is applicable to the extent that contaminated soil (as defined by Mich. Comp. Laws § 324.20120c(5)(a)) is relocated on-site as part of this response action.

U.S. EPA guidance issued in January 2017, requested that Action Memoranda discuss potential uncertainties related to the cost estimate. The response actions selected herein will not be funded by U.S. EPA, they will be undertaken and funded by Dow pursuant to the Segments 4 & 5 AOC. The level of uncertainty or data gaps related to the extent of contamination that may exist prior to initiation of the response action has the potential to affect costs. In this case, there are more than 2,400 sediment TEQ samples and more than 775 bank TEQ samples in Segments 4 & 5, so the SMAs and BMAs are well characterized, and the scope of work is unlikely to change in a way that substantially increases costs. However, U.S. EPA expects that pre-design investigations will be conducted to support the final design. Finally, for some response actions there could be potential complexities or complications that may trigger increases in costs. For this Segments 4 & 5 NTCRA, U.S. EPA does not anticipate that this will occur. Dow, under U.S. EPA oversight, has conducted similar response actions at upstream SMAs and BMAs. Actual costs for those prior response actions have been similar to or slightly less than U.S. EPA's initial cost estimate.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Continued risk to public health or the environment will result if this response action is delayed or not taken. Delayed action increases the chance that highly contaminated surface sediment and/or riverbank soil could be further exposed or migrate to areas where human or ecological exposures could increase.

VII. OUTSTANDING POLICY ISSUES

According to Directive 9360.0-19, from the Office of Solid Waste and Emergency Response (OSWER), March 3, 1989, U.S. EPA Headquarters consultation must occur prior to conducting removal actions at sites that are not listed on the NPL where taking that removal action may be nationally significant or precedent-setting. That Directive at Section I.3 identifies as nationally significant or precedent-setting "*[r]emoval actions at sites involving any form of dioxin when it is one of the principal contaminants of concern.*" Further, the OSWER memorandum dated December 13, 1996, titled "Headquarters Consultation for Dioxin Sites," requests that Regions consult with Headquarters where remediation goals are to be developed for dioxin in soil.

The Segments 4 & 5 EE/CA and this NTCRA do not develop or select remediation goals for dioxin in soil or sediment; rather the actions are performance based. However, this is a removal action at a non-NPL site where dioxins are the principal contaminants of concern. Therefore, pursuant to Directive 9360.0-19, Region 5 did consult with Headquarters for this NTCRA at Segments 4 & 5. Region 5, among other activities: included Headquarters in the Alternative Array briefing on July 6, 2016; conducted a briefing for the Contaminated Sediments Technical Advisory Group, including Headquarters sediment experts, on August 3, 2016; provided to Headquarters an opportunity to review and comment on the Segments 4 & 5 EE/CA and U.S. EPA's proposed plan factsheet before they were finalized, and made available to the public; and provided to Headquarters an opportunity to review and comment on the draft Segments 4 & 5 Action Memorandum.

VIII. ENFORCEMENT

This action is being undertaken pursuant to the Segments 4 & 5 AOC between U.S. EPA and Dow. An enforcement addendum to this Action Memorandum details the enforcement strategy at the Tittabawassee River, Saginaw River & Bay site, Michigan.

IX. RECOMMENDATION

This decision document represents the selected removal action for Segments 4 & 5 located within the Tittabawassee River, Saginaw River & Bay site, Michigan. It was developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based upon the Administrative Record for Segments 4 & 5, an index of which is Attachment C.

Conditions at Segments 4 & 5 meet the criteria of Section 300.415(b) of the NCP for a removal action, and I recommend your approval of the proposed removal action. Region 5 expects that the potentially responsible party will perform the removal action under the oversight of the RPM/OSC. You may indicate your decision by signing below.

APPROVE 
Director, Superfund Division

DATE: 2/8/2017

DISAPPROVE _____
Director, Superfund Division

DATE: _____

Enforcement Addendum

Attachments:

- A. General Segments 4 & 5 Location Map
- B. Segments 4 & 5 SMAs and BMAs
- C. Administrative Record Index
- D. EJ Screening
- E. Responsiveness Summary

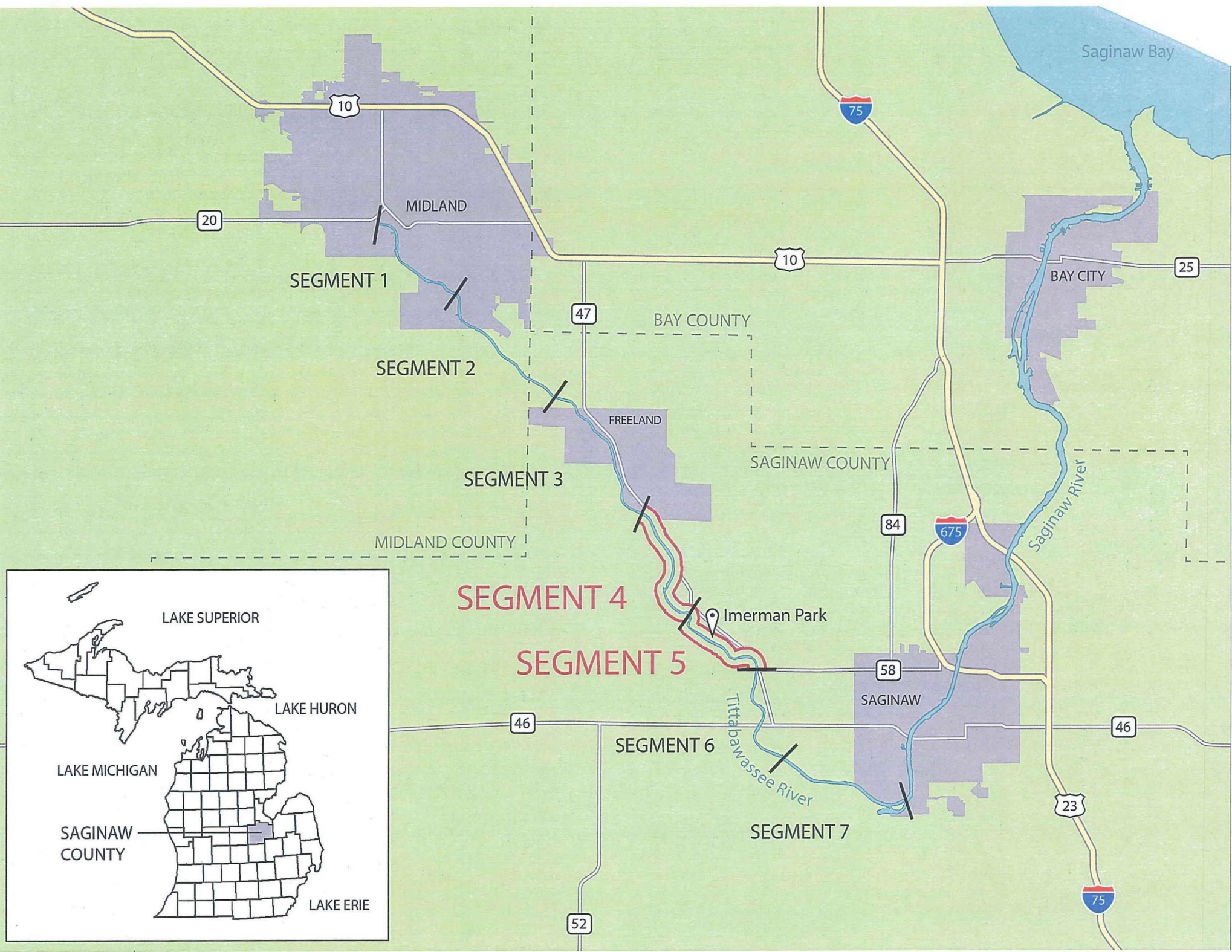
cc: J. Tanaka, J. El-Zein, S. Hanson, M. Logan, D. Russell, J. Cahn, C. Garypie – U.S. EPA Region 5
S. Yi, U.S. EPA Headquarters, w/o Enf. Addendum
A. Taylor, MDEQ, w/o Enf. Addendum
P. Synk, Michigan Department of Attorney General, w/o Enf. Addendum
L. Williams, FWS, w/o Enf. Addendum

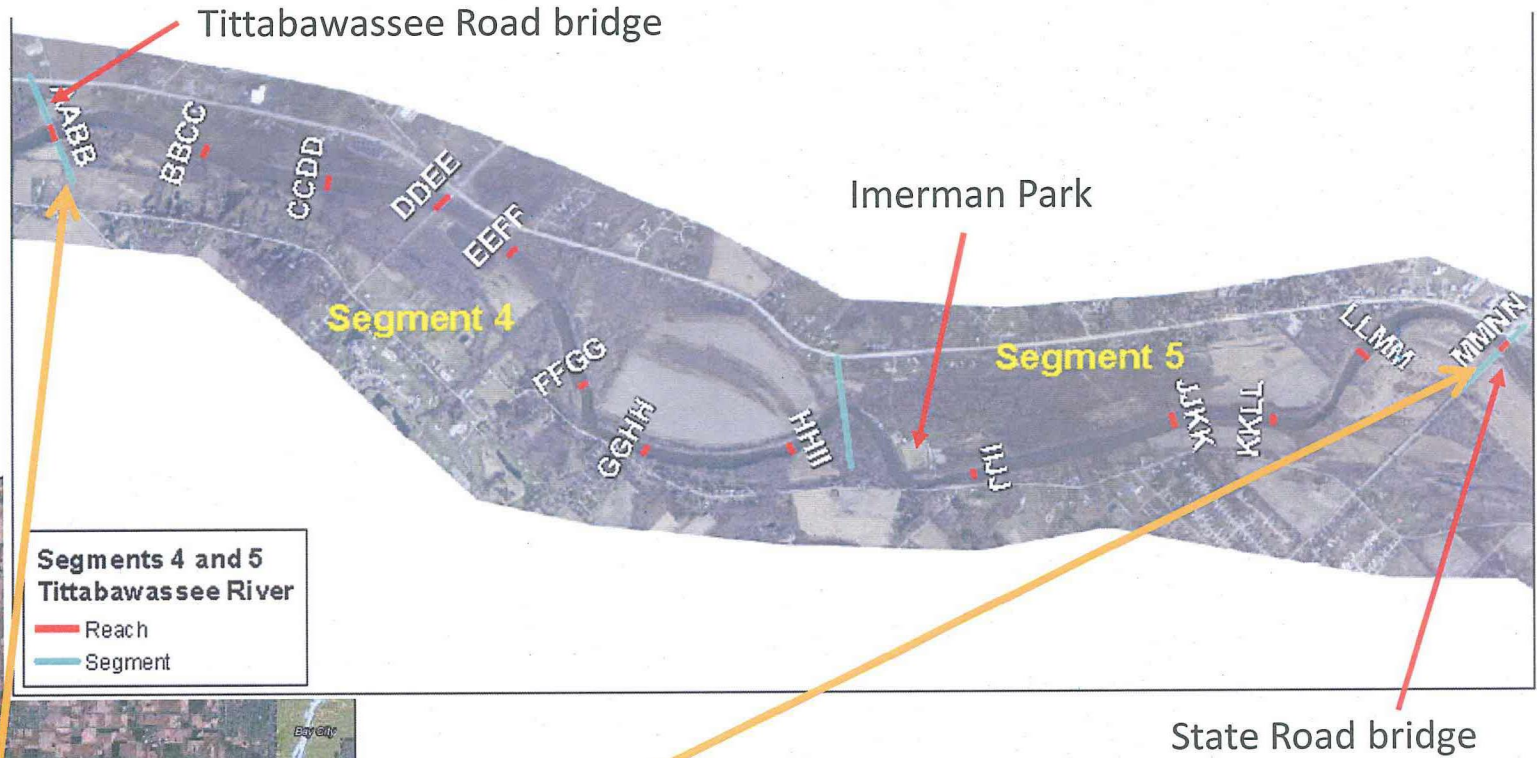
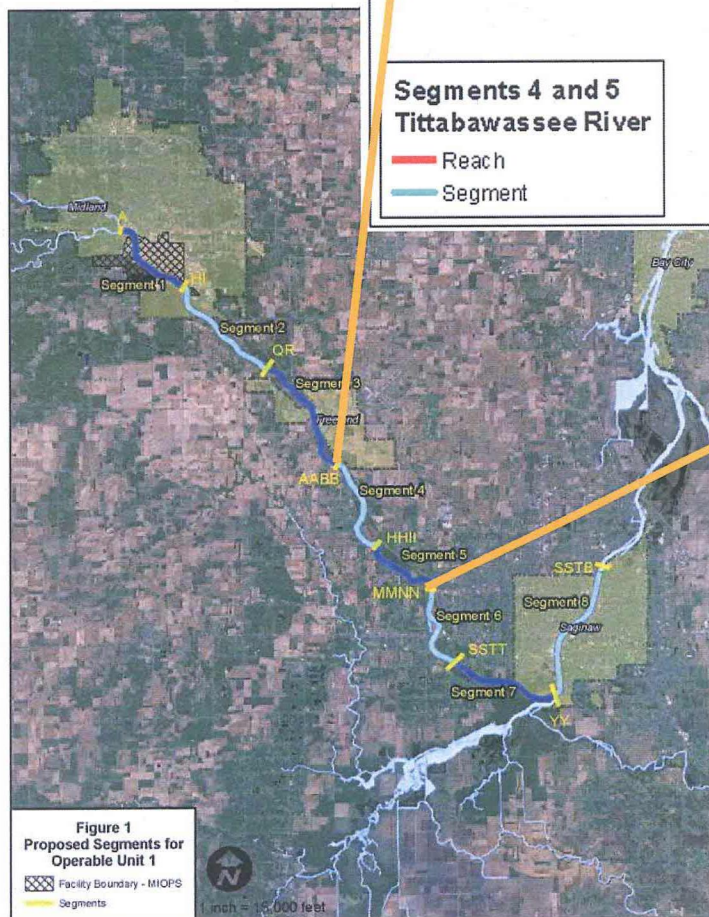
ATTACHMENT A

General Segments 4 & 5 Location Map

**Tittabawassee River, Saginaw River & Bay Site
Midland, Saginaw, and Bay Counties in Michigan**

January 2017





General Segments 4 & 5
Location Map

ATTACHMENT B

Segments 4 & 5 SMAs and BMAs

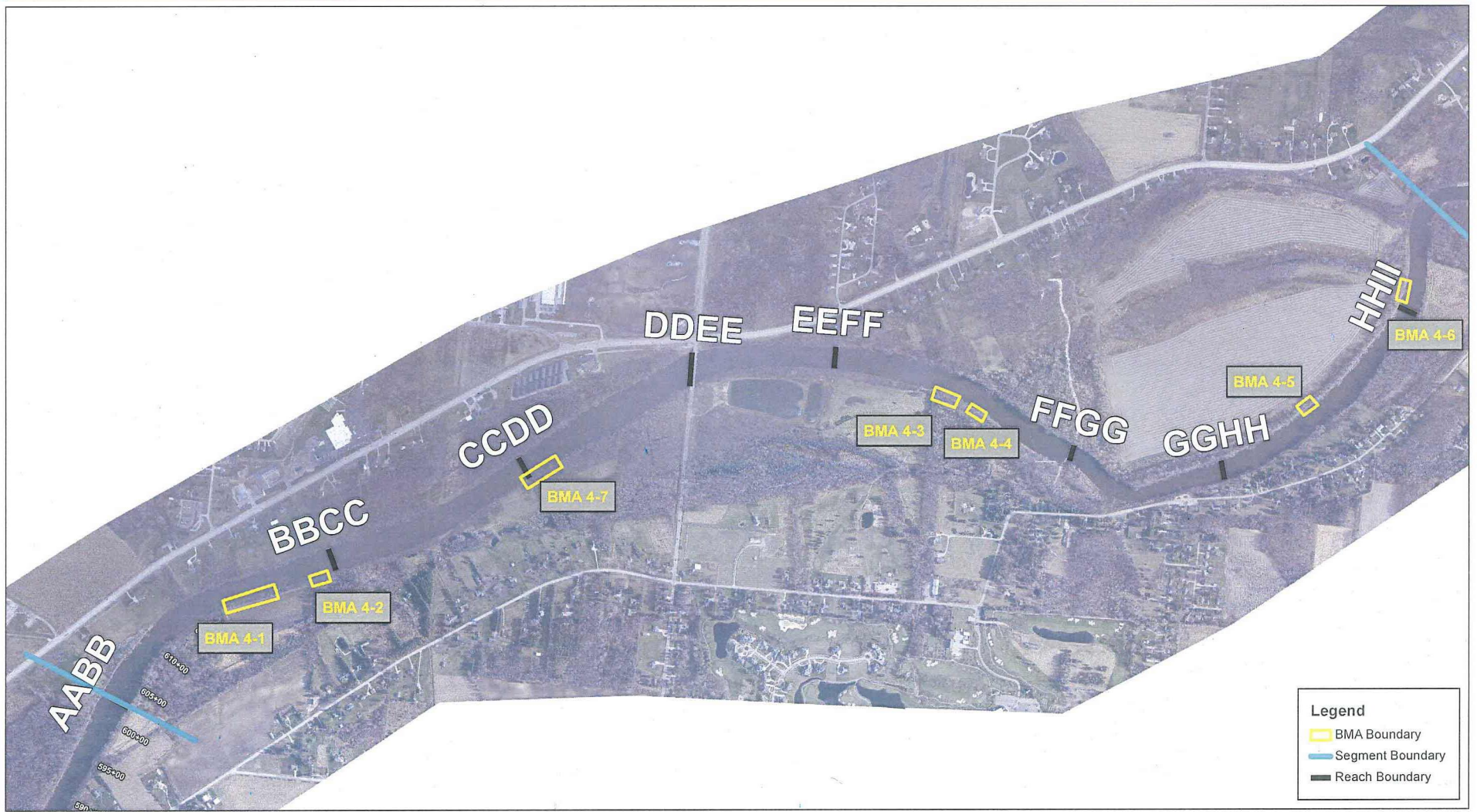
**Tittabawassee River, Saginaw River & Bay Site
Midland, Saginaw, and Bay Counties in Michigan**

January 2017

The Sediment Management Areas (SMAs) and Bank Management Areas (BMAs) in Segments 4 & 5 of the Tittabawassee River where Work is required are depicted below and shown on the attached figures. Additional SMAs and/or BMAs in Segments 4 or 5 may be identified and may be added to the Site through an addendum to or amendment of the Segments 4 & 5 Action Memorandum by U.S. EPA and amendment of the Segments 4 & 5 Settlement Agreement by the Parties.

SMA	LOCATION	Approximate Size (acres)
5-1	Reach II, south	0.7
5-2	Reach KK, north	0.7

BMA	LOCATION	Approximate Length (feet)
4-1	Reach BB, southwest	600
4-2	Reach BB, southwest	200
4-3	Reach FF, southwest	300
4-4	Reach FF, southwest	200
4-5	Reach HH, northeast	200
4-6	Reach II, northeast	250
4-7	Reach CC/DD, southwest	450
5-1	Reach II, northeast	450
5-2	Reach II, northeast	150
5-3	Reach JJ, northeast	500
5-4	Reach JJ, northeast	200
5-5	Reach JJ, northeast	400
5-6	Reach KK, northeast	400
5-7	Reach KK, southwest	250
5-8	Reach LL, northeast	800
5-9	Reach LL, northeast	500
5-10	Reach MM, southwest	350



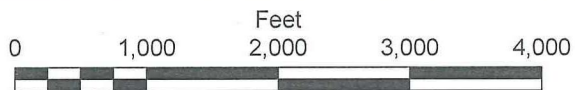
Notes:
Aerial Imagery - 2014



Segment 4 BMA and SMA Overview
Tittabawassee River



Notes:
Aerial Imagery - 2014



Segment 5 BMA and SMA Overview
Tittabawassee River

ATTACHMENT C

Administrative Record Index

**Segments 4 & 5 of the
Tittabawassee River, Saginaw River & Bay Site
Midland, Saginaw, and Bay Counties in Michigan**

January 2017

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION

ADMINISTRATIVE RECORD
FOR THE
TITTABAWASSEE RIVER, SAGINAW RIVER AND BAY SITE
OPERABLE UNIT 13: SEGMENT 4 & 5
MIDLAND, SAGINAW, AND BAY COUNTIES, MICHIGAN

ORIGINAL
SEPTEMBER 2016
SEMS ID:

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	388810	4/20/11	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 8: Island MM - Original <i>(Documents listed on this index are incorporated by reference in this Administrative Record)</i>	2
2	928973	7/25/11	Konechne, T., Dow Logan, M., U.S. Chemical Company EPA		Reach MM In-Channel Island Removal Action Work Plan	31
3	409602	8/4/11	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 9: Segment 1 - Original <i>(Documents listed on this index are incorporated by reference in this Administrative Record)</i>	5
4	928974	8/17/11	Konechne, T., Dow Logan, M., U.S. Chemical Company EPA		Addendum 1 to Reach MM In- Channel Island Removal Action Work Plan	10
5	928979	8/19/11	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Reach MM In-Channel Island Removal Action Work Plan	4
6	409884	11/1/11	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 9: Segment 1 - Update 1 <i>(Documents listed on this index are incorporated by reference in this Administrative Record)</i>	6

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
7	928975	6/8/12	Konechne, T., Dow Chemical Company	Logan, M., U.S. EPA	Reach MM In-Channel Island Removal Action Final Report	86
8	928978	7/12/12	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Notification of Completion and Determination of Compliance with the Administrative Order for Island MM of the Tittabawassee River	2
9	904852	7/10/13	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 10: Segment 2 - Original (<i>Documents listed on this index are incorporated by reference in this Administrative Record</i>)	8
10	920767	8/23/13	Konechne, T., Dow Chemical Company	Logan, M., U.S. EPA	Segment 3-7 Bank Characteristic Survey Work Plan	7
11	920773	9/6/13	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Review and Approval of Segment 3-7 Bank Characteristic Survey Work Plan	1
12	920772	3/28/14	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Review and Partial Approval of Segment 3-7 Bank Characteristic Survey Work Plan	1
13	928983	9/3/14	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Request to Proceed with Work on Segment 4 Response Proposal	1
14	928982	1/8/15	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Dow Agreement to EPA Request for Segments 4 and 5 Combined Response Proposal	2
15	928981	4/21/15	Logan, M., U.S. EPA	Karl, R., U.S. EPA	Memo re: Engineering Evaluation/Cost Analysis Approval Memorandum for a Proposed Non-Time Critical Removal Action at Segments 4 and 5	8
16	918562	5/28/15	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 10: Segment 2 - Update 1 (<i>Documents listed on this index are incorporated by reference in this Administrative Record</i>)	1

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
17	920814	8/24/15	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 12: Segment 3 - Original (<i>Documents listed on this index are incorporated by reference in this Administrative Record</i>)	4
18	928970	12/18/15	Dow Chemical Company	U.S. EPA	Sediment and Bank Soil SCOI Screening for Segments 4 through 7, Tittabawassee River	176
19	928971	12/18/15	Konechne, T., Dow Chemical Company	Logan, M., U.S. EPA	Letter re: Draft Segment 4 and 5 Response Proposal	1
20	922740	1/26/16	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 12: Segment 3 - Update 1 (<i>Documents listed on this index are incorporated by reference in this Administrative Record</i>)	1
21	928977	2/26/16	Williams, L., U.S. DOI	Logan, M., U.S. EPA	National Resource Trustees' Comments on the Draft Tittabawassee River Segment 4 and 5 (OU1) Response Proposal	7
22	928986	3/4/16	Synk, P., Michigan Dept. of Attorney General	Logan, M., U.S. EPA	Email re: Comments on ARAR Provisions in Tittabawassee River Segments 4 and 5 Draft Response Proposal	4
23	923481	3/8/16	U.S. EPA	Public	Administrative Record Site Index - Tittabawassee River, Saginaw River and Bay, Operable Unit 12: Segment 3 - Update 1 (<i>Documents listed on this index are incorporated by reference in this Administrative Record</i>)	1
24	928987	3/11/16	Taylor, A., MDEQ	Logan, M., U.S. EPA	Email re: Comments on Tittabawassee River Segments 4 and 5 Draft Response Proposal	16
25	928980	3/17/16	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Agencies' Review Comments on Tittabawassee River Segments 4 and 5 Response Proposal	20
26	928972	5/31/16	Konechne, T., Dow Chemical Company	Logan, M., U.S. EPA	Revised Tittabawassee River Segments 4 and 5 (OU1) Response Proposal	1709

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
27	928976	5/31/16	Dow Chemical Company	U.S. EPA	Responses to Agencies' Review Comments on the Draft Tittabawassee River Segments 4 and 5 Response Proposal Dated December 18, 2015	25
28	928985	7/28/16	Logan, M., U.S. EPA	Kniffen, S., Saginaw Chippewa Indian Tribe of Michigan	Email re: Invitation to Saginaw Chippewa Indian Tribe to Consult on Upcoming Tittabawassee River Segments 4 & 5 Cleanup Proposal	1
29	928988	8/5/16	Taylor, A., MDEQ	Logan, M., U.S. EPA	Email re: Segments 4 and 5 Response Proposal	1
30	928984	8/29/16	Logan, M., U.S. EPA	Konechne, T., Dow Chemical Company	Letter re: Approval of Tittabawassee River Segments 4 & 5 Response Proposal	4
31	929424	9/12/16	U.S. EPA	Public	Fact Sheet - EPA Proposes Cleanup Plan for Tittabawassee River: Segments 4 & 5	8

**U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION**

**ADMINISTRATIVE RECORD
FOR THE
TITTABAWASSEE RIVER, SAGINAW RIVER AND BAY SITE
OPERABLE UNIT 13: SEGMENT 4 & 5
MIDLAND, SAGINAW, AND BAY COUNTIES, MICHIGAN**

**UPDATE 1
JANUARY, 2017
SEMS ID:**

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
1	<u>931218</u>	9/19/16	Public Commenter	U.S. EPA	Public Comment Sheet on Proposed Plan for Segments 4 & 5	2
2	<u>931219</u>	9/19/16	Public Commenter	U.S. EPA	Public Comment Sheet on Proposed Plan for Segments 4 & 5	2
3	<u>931216</u>	9/21/16	Public Commenter	U.S. EPA	Public Comment Email on Proposed Plan for Segments 4 & 5	2
4	<u>931220</u>	9/21/16	Public Commenter	U.S. EPA	Public Comment Sheet on Proposed Plan for Segments 4 & 5	2
5	<u>931217</u>	9/22/16	Public Commenter	U.S. EPA	Public Comment Email on Tittabawassee River Toxins and Remediation	1
6	<u>931221</u>	9/22/16	Public Commenter	U.S. EPA	Public Comment Sheet on Proposed Plan for Segments 4 & 5	2
7	<u>931223</u>	10/3/16	Collins, J., Aquablok	U.S. EPA	Public Comment Email on Proposed Plan for Segments 4 & 5	4
8	<u>931222</u>	10/18/16	Public Commenter	U.S. EPA	Public Comment Email on Proposed Plan for Segments 4 & 5	3
9	<u>931225</u>	10/19/16	U.S. EPA	File	Transcript of Public Meeting for Proposed Plan for Segments 4 & 5	49

<u>NO.</u>	<u>SEMS ID</u>	<u>DATE</u>	<u>AUTHOR</u>	<u>RECIPIENT</u>	<u>TITLE/DESCRIPTION</u>	<u>PAGES</u>
10	<u>931224</u>	10/30/16	Sommers, D., Saginaw- Tittabawassee Rivers	U.S. EPA	Public Comment Email on Proposed Plan for Segments 4 & 5	20

ATTACHMENT D

EJ Screening

**Segments 4 & 5 of the
Tittabawassee River, Saginaw River & Bay Site
Midland, Saginaw, and Bay Counties in Michigan**

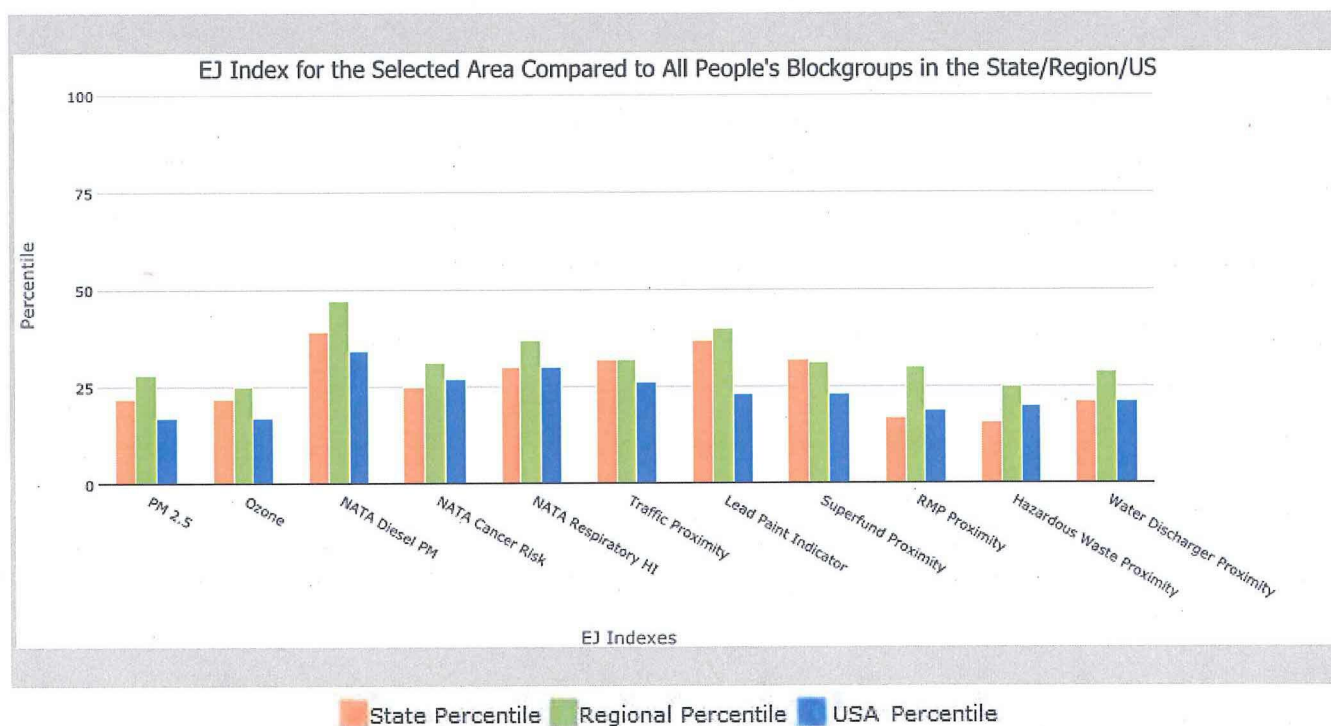
January 2017

.5 mile Ring around the Corridor, MICHIGAN, EPA Region 5

Approximate Population: 2,960

Input Area (sq. miles): 6.43

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	22	28	17
EJ Index for Ozone	22	25	17
EJ Index for NATA* Diesel PM	39	47	34
EJ Index for NATA* Air Toxics Cancer Risk	25	31	27
EJ Index for NATA* Respiratory Hazard Index	30	37	30
EJ Index for Traffic Proximity and Volume	32	32	26
EJ Index for Lead Paint Indicator	37	40	23
EJ Index for Superfund Proximity	32	31	23
EJ Index for RMP Proximity	17	30	19
EJ Index for Hazardous Waste Proximity*	16	25	20
EJ Index for Water Discharger Proximity	21	29	21

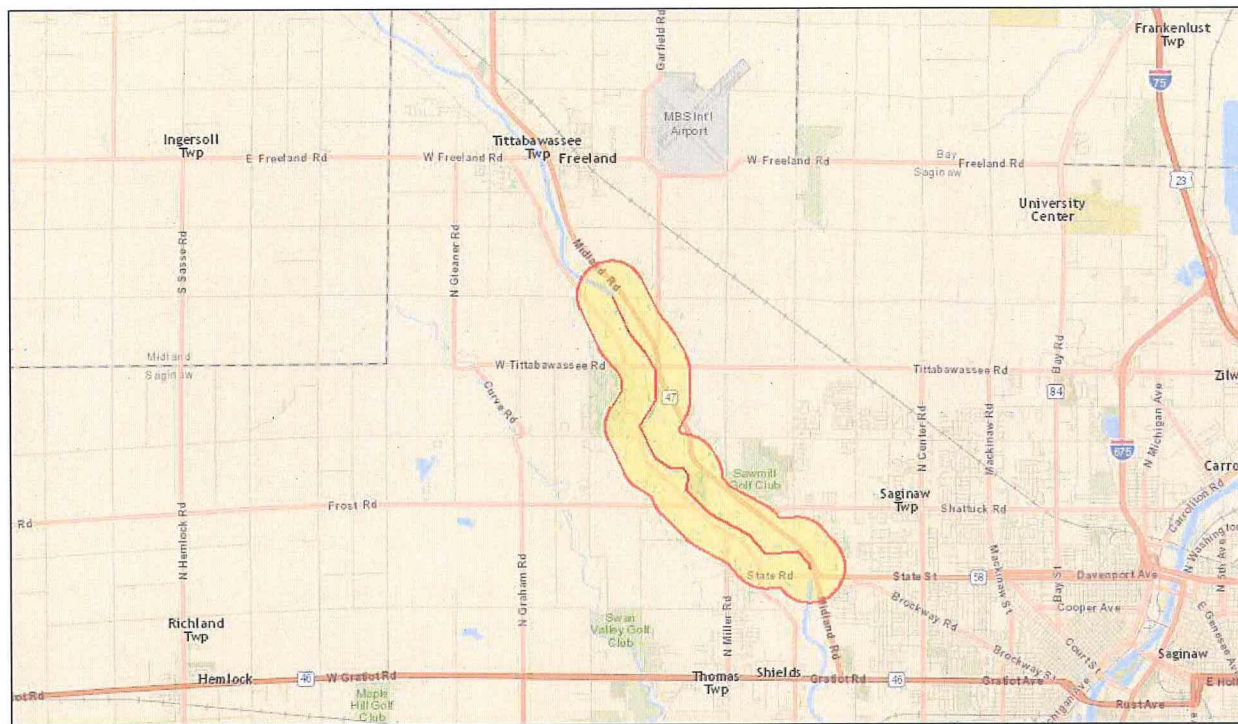


This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

.5 mile Ring around the Corridor, MICHIGAN, EPA Region 5

Approximate Population: 2,960

Input Area (sq. miles): 6.43



October 31, 2016

Buffer Area
Digitized Line

1:144,448

0 1.25 2.5 5 mi

0 2 4 8 km

Sources: Esri HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, IGN, © OpenStreetMap contributors, and the GIS User Community

Sites reporting to EPA

Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	0

EJSCREEN Report (Version 2016)



.5 mile Ring around the Corridor, MICHIGAN, EPA Region 5

Approximate Population: 2,960

Input Area (sq. miles): 6.43

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in $\mu\text{g}/\text{m}^3$)	9.4	9.76	18	10.6	11	9.32	48
Ozone (ppb)	48.2	50.3	12	50.3	17	47.4	48
NATA* Diesel PM ($\mu\text{g}/\text{m}^3$)	0.404	0.726	32	0.931	<50th	0.937	<50th
NATA* Cancer Risk (lifetime risk per million)	28	31	37	34	<50th	40	<50th
NATA* Respiratory Hazard Index	1.1	1.3	35	1.7	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	120	570	50	370	58	590	54
Lead Paint Indicator (% Pre-1960 Housing)	0.15	0.39	27	0.39	27	0.3	44
Superfund Proximity (site count/km distance)	0.052	0.14	43	0.12	45	0.13	44
RMP Proximity (facility count/km distance)	0.15	0.32	56	0.51	36	0.43	44
Hazardous Waste Proximity* (facility count/km distance)	0.06	0.1	51	0.11	47	0.11	44
Water Discharger Proximity (facility count/km distance)	0.18	0.25	64	0.31	54	0.31	57
Demographic Indicators							
Demographic Index	19%	30%	40	29%	43	36%	29
Minority Population	17%	24%	60	24%	58	37%	36
Low Income Population	22%	35%	31	33%	35	35%	32
Linguistically Isolated Population	1%	2%	65	2%	61	5%	47
Population With Less Than High School Education	5%	11%	29	11%	31	14%	27
Population Under 5 years of age	5%	6%	40	6%	36	6%	35
Population over 64 years of age	17%	15%	66	14%	69	14%	71

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: <https://www.epa.gov/national-air-toxics-assessment>.

+ The hazardous waste environmental indicator and the corresponding EJ index will appear as N/A if there are no hazardous waste facilities within 50 km of a selected location.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

ATTACHMENT E

Responsiveness Summary

**Segments 4 & 5 of the
Tittabawassee River, Saginaw River & Bay Site
Midland, Saginaw, and Bay Counties in Michigan**

January 2017

RESPONSIVENESS SUMMARY

Non-Time Critical Removal Action for Segments 4 & 5 of the Tittabawassee River/Saginaw River & Bay Site

This Responsiveness Summary provides a summary of the public comments that the United States Environmental Protection Agency (EPA) received regarding a proposed non-time critical removal action (NTCRA) at Segments 4 & 5, and comments on the *Tittabawassee River Segments 4 and 5 (OU 1) Response Proposal*, dated May 31, 2016 (Segments 4 & 5 EE/CA) at the Tittabawassee River/Saginaw River & Bay Site (Site). This Responsiveness Summary also provides EPA's responses to those comments, developed in consultation with the Michigan Department of Environmental Quality (MDEQ).

I. Outcome of Review of Public Comments and State Consultation

After carefully reviewing and considering all public comments submitted during the public comment period, EPA, in consultation with MDEQ, signed an Action Memorandum selecting response actions for Sediment Management Areas (SMAs) and Bank Management Areas (BMAs) within Segments 4 & 5. The public comments did not result in changes to EPA's comparative evaluation of the options. Therefore, the selected response actions are those that were identified by EPA as the recommended alternatives.

EPA, after consultation with MDEQ, negotiated an Administrative Settlement Agreement and Order on Consent (Segments 4 & 5 AOC) with The Dow Chemical Company (Dow), requiring Dow to implement the selected work. A copy of the Segments 4 & 5 AOC, Action Memorandum, and this Responsiveness Summary (which is Attachment D to the Action Memorandum) will be available through <http://www.epa.gov/superfund/tittabawassee-river>.

II. Background and Community Involvement

Dioxins (primarily furans) are found in the Tittabawassee and Saginaw Rivers and their floodplains, and in Saginaw Bay. The dioxins came from past waste disposal practices at Dow's plant in Midland, Michigan. EPA began negotiations with Dow in December 2008 for a comprehensive approach to address contamination related to Dow in the rivers and Bay. Effective January 21, 2010, EPA signed an Administrative Settlement Agreement and Order on Consent (2010 AOC) with MDEQ and Dow, requiring Dow to perform Site investigations, and develop and design cleanup options selected by EPA, in consultation with MDEQ, using Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) authority. Work under the 2010 AOC (No. V-W-10-C-942) is ongoing.

The 2010 AOC and its associated Statement of Work (2010 SOW) requires Dow, with EPA and MDEQ oversight, to conduct evaluations of current conditions and assessments of response options to protect human health and the environment at the Site. The 2010 AOC also required Dow to define segments within Operable Unit 1 that would be assessed and addressed in a sequential upstream-to-downstream approach. Segments 4 & 5 are the fourth and fifth of seven segments

delineated within the Tittabawassee River. EPA, in consultation with MDEQ, directs the use of EPA's removal and/or remedial program authorities under CERCLA, and Dow is required to submit either a Feasibility Study or an EE/CA for each segment. EPA determined that Dow should submit an EE/CA for Segments 4 & 5 based on a review of EPA's guidance, the National Contingency Plan (NCP), and conditions in Segments 4 & 5, and documented this in an EE/CA Approval Memorandum dated April 21, 2015. Dow submitted the final Segments 4 & 5 EE/CA dated May 31, 2016. EPA, in consultation with MDEQ, approved the Segments 4 & 5 EE/CA with modifications on August 29, 2016. The Segments 4 & 5 EE/CA includes proposed alternatives to address sediment contamination within specific SMAs and soil contamination within specific BMAs.

On or before September 12, 2016, EPA established the administrative record for Segments 4 & 5. The administrative record for a response action serves an important purpose: it contains the information that explains why EPA will conduct a particular response at a site. EPA published the administrative record on the Site website at www.epa.gov/superfund/tittabawassee-river and sent copies to three local repositories (public libraries in Midland, Saginaw and Bay City). On or before September 14, 2016, EPA posted and mailed a fact sheet titled "EPA Proposes Cleanup Plan for Tittabawassee River: Segments 4 & 5." This fact sheet described the Segments 4 & 5 EE/CA and EPA's recommended response actions and sought public comment on the Segments 4 & 5 EE/CA and the administrative record, pursuant to the requirements of NCP § 300.415(n). The fact sheet was mailed to a list of about 1,500 recipients. EPA took ads in six local papers to announce the proposed cleanup plan and the opportunities for public comment.

EPA expected that the public would want more than the normal 30-day public comment period and therefore provided in advance a 15-day extension to the public comment period. The public comment period ran from September 22 through November 6, 2016. EPA presented its proposed options to the Saginaw Tittabawassee Rivers Contamination Community Advisory Group (CAG), the technical advisor to the CAG – Environmental Stewards Consulting, Inc. (ESC), and a few public attendees at the CAG meeting on September 19, 2016. EPA, with participation of MDEQ, held a public meeting regarding the proposed response actions on October 19, 2016, at the Arrowwood Elementary School, Saginaw, Michigan.

III. Comments and Responses

EPA received written comments during the public comment period from 9 different individuals and organizations, including: floodplain property owners; an individual representing a technology vendor; the CAG; and ESC on behalf of the CAG. There was also an opportunity to make verbal comments at the public meeting, and one person made verbal comments at that meeting. Copies of all the comments received (including the verbal comments reflected in the transcript of the public meeting) are included in the administrative record for Segments 4 & 5. EPA carefully considered each comment while developing this Responsiveness Summary.

This Responsiveness Summary does not repeat verbatim each individual comment. Rather, the comments are summarized and grouped by category with respect to the type of issue raised. The comments fell within several different categories: remedy options; remedy implementation; additional information requested and recommendations; specific comments on documents; dioxins

and health; comments on the floodplain; and miscellaneous comments. The remainder of this Responsiveness Summary contains a summary of the comments received (grouped by category) and EPA's responses to those comments, in consultation with MDEQ.

A. REMEDY OPTIONS

1. One commenter believes that the Tittabawassee River will never be clean.

The overall approach to the Site is to conduct cleanup in an upstream to downstream fashion, segment-by-segment. The basis for action for the Segments 4 & 5 cleanup is to control the potential that the SMAs and BMAs act as ongoing sources of dioxin/furans to the river sediment. Because clean materials move into the Site from upstream, controlling sources should result in lower river-wide sediment levels over time. These lower sediment levels should result in lower uptake into fish and lower levels of dioxins/furans in the sediment that is deposited from flooding or that moves farther downstream. EPA, working with MDEQ and Dow, is monitoring trends in sediment and fish tissue concentrations over time to assess the impact of the source control actions.

2. Two commenters described EPA's proposed remedies as a "band aid." They do not support leaving contaminated material in banks or sediment.

Regarding the commenters preference for removal, EPA's "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites" (December 2005, OSWER 9355.0-85) clearly outlines EPA policies on remedy selection for contaminated sediment sites. These include:

- There is no presumptive remedy for any contaminated sediment site, regardless of the contaminant or level of risk.
- Generally, EPA should evaluate dredging, capping and monitored natural recovery (MNR) at every site.
- Both in-situ and ex-situ approaches may reach acceptable levels of effectiveness and permanence.
- EPA must consider both risk reduction associated with reduced exposure to contaminants, and also risks introduced by implementing alternatives.

EPA, in consultation with MDEQ, developed and evaluated an array of protective response options, including removal options, for the Segments 4 & 5 SMAs and BMAs. Protectiveness is a threshold criterion that must be met for an option considered. When comparing NTCRA response options, EPA is required to evaluate the response options against three criteria: effectiveness; implementability; and cost. Additionally, as discussed in comment 17.e below, EPA also evaluated cleanup alternatives against the remedial evaluation criteria. The Action Memorandum to which this Responsiveness Summary is attached provides EPA's assessment of the selected response actions and how they meet the evaluation criteria. In short, EPA believes that the final selected response actions achieve the best balance of EPA's evaluation criteria.

3. One commenter wants to see dredging of the entire river to control flooding and removal of all bank soil on his property.

Regarding dredging to control flooding – CERCLA does not allow EPA to take action solely to control flooding. CERCLA Section 106 states that EPA may take action where EPA has determined that there is an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance. For Segments 4 & 5, EPA determined that there is an imminent and substantial endangerment to the public health or welfare or the environment from actual or threatened release of contaminants from specific SMAs and BMAs. As a result, an EE/CA was prepared in order to determine possible response actions to address the threats from hazardous substances. After following EPA's EE/CA guidance documents, along with the requirements of the 2010 AOC, the Segments 4 & 5 EE/CA was completed and segment-wide dredging was not considered an appropriate response action at Segments 4 & 5. Regarding the removal of all bank soil from the property that is subject of this comment – at this time, no BMAs have been identified as requiring cleanup. Therefore, no response actions are currently proposed for the commenter's banks.

4. *One commenter expressed a high degree of distrust of and disdain for government at all levels. This extended to distrust of governmental decision-making, including EPA's proposed cleanup plan for Segments 4 & 5.*

EPA recognizes that some people do not trust the government. EPA's regulations spell out specific requirements as to how response actions are identified, evaluated, and selected. EPA followed those regulations in coming to the Segments 4 & 5 decision. Additionally, EPA has gone beyond the regulatory requirements for public involvement at the Site, in order to develop and select transparent decisions. EPA will continue to provide opportunities to the community to participate in Site decisions.

5. *An individual representing a technology vendor provided information to support the use of powered activated carbon (PAC) as a component of a cap that could reduce bioavailability for compounds like dioxin and PCBs. They request that amendments such as PAC receive due consideration in the final cap design.*

EPA is aware of PAC and other reactive cap components, and supportive of their consideration, where appropriate. As discussed in the response to comment 1, the basis for action for the Segments 4 & 5 cleanup is to control the potential that the SMAs act as ongoing sources of dioxin/furans to the river sediment. Source control, in this case, is intended to prevent the erosion and transport of furan-laden graphitic particles, not to chemically isolate dissolved phase contaminants. Therefore, it is unlikely that PAC would be used in the cap. However, EPA and Dow will further evaluate this in design.

6. *ESC provided a discussion of Monitored Natural Recovery (MNR) including comments on: processes that might be occurring; that MNR does not break down dioxins/furans; and that it is not effective for all site conditions.*

EPA acknowledges these comments. In addition to the references cited by ESC, there is extensive discussion of MNR in Chapter 4 of EPA's "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites."

7. *ESC provided a discussion of dredging. The submittal summarized and discussed: environmental dredging methods and technologies; transportation of removed sediment; disposal options; fewer or no long-term obligations; and short-term increases of contaminants in the water column and fish tissue.*

EPA acknowledges these comments. In addition to the references cited by ESC, there is extensive discussion of dredging and excavation in Chapter 6 of EPA's "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites."

8. *ESC provided a discussion of capping. The submittal summarized and discussed: capping purpose and technologies, including armoring; emerging technologies such as reactive caps; issues related to durability, including natural and anthropogenic erosive forces; bioturbation; consideration of future conditions and infrastructure like recreation uses, navigation channels, and utility pipelines; and cap longevity; the need for monitoring in perpetuity and possible maintenance.*

EPA acknowledges these comments. In addition to the references cited by ESC, there is extensive discussion of in-situ capping in Chapter 5 of EPA's "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites."

9. *ESC commented on potential implications and impacts from dredging and/or capping. They discussed: in-channel habitat/biodiversity loss and/or homogenization; impacts on surrounding upland habitats; resuspension; use of best management practices to minimize impacts; recontamination and steps to prevent it; resuspension of dredged material; and impact of capping on water depth*

EPA acknowledges these comments. EPA recognizes that there are trade-offs that come with all of the sediment remediation approaches. As discussed in the response to comment 2, EPA must consider both risk reduction associated with reduced exposure to contaminants, and also risks introduced by implementing alternatives. The specific trade-off for the Segments 4 & 5 SMAs are discussed in the Segments 4 & 5 EE/CA and summarized in the Action Memorandum.

10. *ESC provided a summary of some other large sediment sites with persistent organic pollutants such as dioxins, furans, and polychlorinated biphenyls (PCBs), and their response options.*

EPA acknowledges these summaries. As noted by ESC, many of the response actions involve a combination of approaches. Additionally, EPA indicates that as of 2015, there have been 150 cleanups selected at more than 70 sediment sites, many using combined approaches. See <https://www.epa.gov/superfund/superfund-contaminated-sediments>

B. REMEDY IMPLEMENTATION

11. *One commenter urged EPA to work with MDEQ because of its experience and familiarity with the Site.*

EPA has been working closely with MDEQ, and will continue to do so in the future.

12. One commenter stated that they have experienced quite a bit of bank erosion and will be happy to comply with whatever bank work is needed.

EPA appreciates the commenter's willingness to cooperate. However, in this case, there are no currently identified BMAs on this commenter's property. Not every eroding bank will require response actions. BMAs are identified based upon both the relative TEQ levels and how much they are eroding. It is common to find eroding banks in river systems. Just because a bank is eroding does not mean it will require cleanup.

13. One commenter asked if all of the trees would be removed from their riverbank.

EPA has selected stabilization for the Segment 4 & 5 BMAs, including the BMAs on this commenter's property. Stabilization does not require that all trees be removed from the riverbank. However, canopy management and at-risk tree removal will occur on the stabilized banks. Canopy management involves cutting back some of the tree canopy to provide more sunlight to a treated bank area, allowing the establishment of erosion resistant, native vegetation. At-risk tree removal selectively targets trees that grow on the banks, that are often listing, with compromised root structures, and that are at high risk of falling into the river (compromising bank stabilization treatments). Dow's team works with each property owner to explain what will happen, and will replace trees, if needed.

14. One commenter stated that they had placed material in and along the river to stabilize their bank. He was concerned that EPA's plan would remove material from his property and contribute to erosion.

In this case, there are no currently identified SMAs or BMAs on or adjacent to this commenter's property. Therefore, the selected response actions will not remove material from the property. There is an overarching monitoring program that assesses whether response actions in one part of the river may contribute to unanticipated erosion in another area.

15. ESC discussed the need for monitoring sediment conditions in perpetuity for sediment response actions that leave persistent chemicals on site (i.e., MNR and capping). ESC provided specific recommendations for monitoring. They recommended that EPA require a monitoring program. They also recommended that EPA require Dow to guarantee the financial resources needed to conduct the monitoring program in perpetuity.

EPA and MDEQ agree that long-term monitoring of the Site is necessary, and EPA and MDEQ require monitoring as part of the work to be performed under the 2010 AOC. Task 4 of the 2010 SOW requires Dow to develop and implement a Site-Wide Monitoring Plan that includes uptake to biota, sediment and contaminant loading, and post-response monitoring. Additionally, each of the Settlement Agreements requiring implementation of NTCRA's has included monitoring as required work. Monitoring of the Site over time will be important to assess and document baseline and ongoing conditions, and to provide a basis for comparing and assessing the effectiveness of response options. Because information needs may change over time, the Site-Wide Monitoring Plan is expected to evolve and change to reflect changing data quality objectives and information

needs. EPA and MDEQ will review ESC's specific recommendations and evaluate if changes to the monitoring program would be beneficial. Regarding the financial resource needed to conduct monitoring, each of the Settlement Agreements requiring implementation of NTCRA's also requires that Dow demonstrate the financial resources needed to complete the work.

C. ADDITIONAL INFORMATION REQUESTED AND RECOMMENDATIONS

16. *The CAG raised several questions and issues, and requested additional information and made recommendations, as outlined below:*

- a. ***"Issue 1. Use of MNR for Remediation*** *The CAG is interested in more fully understanding previously documented effectiveness and performance of Monitored Natural Recovery, (MNR) at other EPA cleanup locations and how EPA made the decision to identify it as a specific component of remediation for SMA 5-1 as it has not previously been specified for use in this cleanup activity. **Recommendation 1.** The CAG requests EPA provide further information to better understand how MNR relates to previous decisions for cleanup in segments 2 through 5 with information about size, location, extent of soil removal, capping, and MNR, and the contamination levels and depths in each and the particular issues related to accessibility, etc. that were used to decide what method was selected for the remediation. The CAG also requests EPA provide a summary description of previous performance monitoring and effectiveness using MNR at other locations."*

EPA will work with the CAG to prepare and present to them the requested information on past and future SMAs and their conditions and response decisions, including specific information on MNR.

- b. ***"Issue 2. Long-Term Monitoring and Financial Assurance*** *A number of proposed cleanup aspects identify that long term monitoring may be needed at sites with contamination in-place, MNR, and at past cleanup remedy locations including capping and bank stabilization locations, and some may require monitoring in perpetuity. The CAG has questions on how adequate funding for these very long term obligations will be provided and maintained as industries merge and ownerships change periodically. **Recommendation 2.** EPA should develop a Fact Sheet explaining the variety of long term obligations expected to be identified during course of this cleanup project, such as monitoring, maintenance, corrective action, etc., what financial assurance methods will be used and how they are to be maintained in order to meet these obligations in perpetuity."*

EPA will work with the CAG to prepare information about the long-term obligations and how they will be implemented, overseen by the Agencies, and funded. EPA anticipates that there will be a slide presentation at a CAG meeting that can be posted to the CAG and EPA websites. Following CAG feedback, EPA anticipates preparing a fact sheet or other written "plain language" information for the public.

- c. ***"Issue 3. Input of Natural Resource Experts*** *The CAG has previously asked EPA if the cleanup remedies being proposed have been reviewed and have the concurrence of other resource protection specialists, such as fish habitat biologists, stream geomorphology experts, and others in order to ensure selected remedies are adequately protective under*

varying conditions. For example, have flood plain reviewers weighed in on the in-stream sediment capping proposals or have riverine habitat biologists approved the stream bank stabilization measures? **Recommendation 3.** EPA should provide a section in the Fact Sheet, describing the coordination and resource protection agency review the proposed remedies have undergone and a statement if reviewers were unanimous in consent and/or identify issues of any dissent.”

EPA works very closely with the natural resource trustees at the Site. There are several state, federal and tribal trustees involved, and the Fish and Wildlife Service functions as the lead trustee. Subpart G of the NCP discusses the role of the natural resource trustees vis-à-vis CERCLA. In particular, § 300.615 lays out the responsibilities of trustees. The trustees’ regulatory responsibilities do not include concurrence on response actions, but instead relate to the assessment of site conditions and various response actions on trust resources (including potential resource damages and mitigation). The trustees are provided an opportunity for input on EPA’s actions at every stage, and EPA carefully considers their input in our decision-making. All comments and other written feedback from the trustees are included in the administrative record for each decision.

- d. **“Issue 4. EPA Web Site** EPA’s web site transition has been difficult, resulting in information on Segments 4 and 5 not as readily available to the public as previous cleanup proposals have been. While the EPA web address provided to the CAG works, public queries on frequently used online search engines (Google, Yahoo, Bing) return pages that are no longer updated, show broken links and ‘Page Not Found’ for the Tittabawassee River/Saginaw River /Saginaw Bay Cleanup. **Recommendation 4.** EPA should remove the old EPA pages that show up in web searches and/or repair the online links and/or enter an auto-redirect connection to allow for public access to the project documentation and specifically the Segment 4 and 5 cleanup proposal.”

EPA recognizes that the website transition has been somewhat frustrating. Region 5 will continue to work with the national program to try to improve the transparency and ease of use of the Site-specific website.

- e. **“Issue 5. Identifying Levels and Concentrations of Residual Contamination** EPA Materials on the proposed Segments 4 and 5 cleanup does not identify or inform the community about the levels and concentrations of the contaminants of interest at the site that remain following cleanup. It would be very useful for the community to understand this information moving forward for all areas that have been remediated, either through the use of a table or figure that is updated as the project progresses. **Recommendation 5.** The CAG recommends that the EPA Factsheet on the proposed segment cleanup be updated to include the contaminant levels at each BMA and SMA location and the average concentrations in areas that are not being remediated.”

The fact sheet titled “EPA Proposes Cleanup Plan for Tittabawassee River: Segments 4 & 5” is part of the administrative record and cannot be modified. The NCP requires EPA to take public comment on the EE/CA. The fact sheet is a tool to simplify EE/CA information, but is not intended as a replacement. EPA notes that there is detailed information about

concentrations, locations, and contaminant depths in the Segments 4 & 5 EE/CA. On October 6, 2016, EPA's project manager sent an email to some CAG members and ESC directing them as to where specifically in the EE/CA the requested information could be found. In future fact sheets (or by other means), EPA will try to use graphical or tabular information that depicts concentrations and locations of contaminants. Additionally, as noted in comment 16.a, EPA will work with the CAG to produce summary information on all of the Tittabawassee River SMAs.

- f. ***“Issue 6. Better Understanding of Decision Rationale** The CAG recognizes that EPA is using a risk-based approach to making cleanup decisions, however the community would still like to understand how these choices are made and the resulting concentrations in the river. **Recommendation 6.** The CAG recommends that EPA to create a fact sheet on its risk based decision process to better inform the public and include that with all decision materials.”*

EPA will work with the CAG to produce public-friendly materials to convey EPA's Site management strategy and decision framework. Please keep in mind that the Segment 4 and 5 SMAs and BMAs identified for removal actions were not identified as a result of a baseline risk assessment. Areas identified for action under this NTRCA were identified because they have elevated TEQ and will act as secondary sources if they erode. A final cleanup decision for all Segments of the Tittabawassee River will be made after monitoring data on the implemented NTCRA's are generated and analyzed; and an assessment of any remaining site risk is conducted.

- g. ***“Recommendation 7.** The TAP consultant evaluation report is attached and should be considered for EPA response as made on behalf of the CAG. The CAG has reviewed all of these concerns with the TAP contractor and passes along this information as issues important to the community.”*

EPA has reviewed and responded to summarized ESC comments as part of this Responsiveness Summary.

17. *ESC also commented on the available information and requested additional information and made recommendations, as outlined below:*
- a. *Because of the size/scope of the cleanup and the amount of detailed background information, ESC recommended that EPA do a better job of explaining its big picture cleanup approach and strategy. ESC recommended that relevant information from previous Site documents be summarized in a way that creates context for the overall impact of EPA's decision strategy.*

Please see responses to comment 16. EPA will work to create information that helps the public better understand Site conditions and EPA's management approach.

- b. *ESC commented that information was lacking in the fact sheet and recommended that information should be provided for the community about the levels and concentrations of the contaminants of interest at the site, either through the use of a table or figure. ESC stated*

that the community should understand the contamination that is being removed and that which is being left in place and how this correlates to EPA's overall risk management strategy.

Please see responses to comment 16. EPA will work to create information that helps the public better understand Site conditions and EPA's management approach.

- c. *ESC recommended "The explanation for Monitored Natural Recovery (MNR) as a viable remediation technology needs to be expanded. This is the first time that MNR has been specifically called out, and it is not clear what contaminant concentrations are being affected and how these compare with previous decisions to take action or not." Additionally, "There needs to be a larger emphasis on the burden and cost associated with long-term monitoring and maintenance that will exist in perpetuity, in particular the criteria by which effectiveness will be judged and the conditions under which additional action would become necessary."*

Please see responses to comment 16.

- d. *ESC requested that a figure showing the fish tissue data collected to date be included in the Response Proposal, as fish tissue is a major indicator of cleanup progress. ESC felt this would help the community to understand the overall context, purpose, status, and effectiveness of the cleanup program.*

EPA agrees with ESC that assessing fish tissue TEQ levels over time is an important metric to track at the Site. Fish tissue monitoring is occurring. EPA cautions that changes in fish tissue levels are long-term objectives, which are likely to require a long time to attain and/or that may require response actions in other segments or throughout the Site. Additionally, some fish species, such as walleye, already have relatively low TEQ concentrations; therefore, temporal trends may be difficult to detect. EPA will work with Dow to include appropriate information about fish tissue TEQ concentrations and project goals in future response proposals.

- e. *ESC acknowledged that EPA is using removal authority, so consequently there are three criteria used for the evaluation of alternatives: effectiveness, implementability, and cost. ESC recommended that it would be helpful for EPA to provide an overview of how the additional remedial criteria are also satisfied (nine criteria include: protection of human health and the environment; compliance with applicable or relevant and appropriate requirements; long-term effectiveness and permanence; reduction of contaminant toxicity/mobility/volume; short-term effectiveness; implementability; cost; state acceptance; community acceptance.).*

EPA agrees that evaluation of the NTCRAs conducted at the site can benefit from evaluation against the nine remedial criteria, as well as the removal criteria. That is why each of the EE/CAs includes a discussion of the remedial criteria (see Section 6 of the Segments 4 & 5 EE/CA).

- f. *ESC commented on the bank management technologies and pointed out that there are numerous specific technologies within each of the bank alternatives (stabilization and*

removal). *ESC suggested that these technologies should be more completely defined and explained to ensure public comment is effective.*

EPA often calls specific technologies within a response alternative “process options.” Section 5.3 of the Segments 4 & 5 EE/CA discusses the BMA alternatives and provides some discussion of the process options. As needed, EPA will work with Dow to include additional information about BMA process options in future response proposals. Early in the public comment period, EPA and Dow attempt to meet with every property owner where a BMA is identified, to explain the technologies and process options, and to remind them that they have the right to comment on the proposed remedy. BMA owners typically have been very accepting of the stabilization alternative and the associated process options. Selection of one or more stabilization process options for each individual Segment 4 and 5 BMA will be performed during the design phase and will be based on several key bank characteristics, including the following: bank angle; bank height; surface soil viability; existing vegetation quality and quantity; bank facing direction; toe condition and potential for undercutting; and potential impacts on neighboring banks/floodplain properties. The design plan is discussed in detail with each affected property owner before they grant access and before construction.

- g. ESC commented “Many of the pilot studies that Dow references have not undergone assessment for a long enough period of time to indicate success or failure and may not achieve objectives over time. We recognize that many or some of these methods may be effective, and that using new technologies is often a positive feature of a remedy. EPA could spell out what plans are in place or anticipated for assessing new methods and criteria for continuing their use.”*

EPA agrees that the cited pilot technologies have been used for a somewhat limited period, and will need ongoing monitoring, and perhaps maintenance to ensure their long-term effectiveness. The performance of many of the technologies has been encouraging to date, including evaluations after some higher energy flow event. EPA will present information to the CAG and other interested community members about plans that are in place or anticipated for assessing these new methods and criteria for continuing their use.

- h. ESC recommended that as part of the evaluation of long-term effectiveness, a larger emphasis on the effects of climate change and increased storm events should be addressed.*

Executive Order 13653 of November 1, 2013, “Preparing the United States for the Impacts of Climate Change,” directs Federal Agencies to integrate consideration of climate change in managing lands and waters. The Order calls for “adaptive learning, in which experiences serve as opportunities to inform and adjust future actions.” The Superfund program is very consistent with the concept of adaptive learning. At this time, the effect of climate change on the long-term effectiveness of response actions at the Site is unclear. The Segments 4 & 5 cleanup plan is a non-time critical removal action. In the future, EPA will make a remedial decision(s) for the Site and impacts of climate change will be considered, as needed, as a component of that decision process. Superfund also requires a Five-Year Review when hazardous substances remain at a site above levels which permit unrestricted use and

unlimited exposure, during which the continued protectiveness of remedies is evaluated. If there is significant climate change that calls into question the long-term effectiveness of response actions, then the effects of climate change may also be evaluated in a Five-Year Review.

18. One commenter asked for analytical data from their property.

The requested data has been provided.

D. SPECIFIC COMMENTS ON DOCUMENTS

19. ESC offered the following comment on the fact sheet: "With regards to the SMA5-1 Alternative 4, the Factsheet states: "The water is too deep in the upstream part of the SMA to allow dry removal, so the area will be capped. The adjacent area is thickly wooded, and wet removal could have substantial impacts on the upland habitat." This statement, however, contradicts an earlier statement also found in the Factsheet: "The Tittabawassee is not deep enough for many wet removal approaches." Please explain this discrepancy, or point to the more detailed explanation for these determinations."

At SMA 5-1, most of the river area is shallow, so excavation is appropriate. This will be done by the installation of a sheet pile wall and dewatering of the cell. However, at the upstream end, there is a deeper "hole" in the sediment that would make the installation of sheet piling challenging and potentially unsafe. The majority of the Tittabawassee River is too shallow for many wet removal approaches such as those that would require barge traffic to bring floating dredges to the job site.

20. ESC commented on the fact sheet that "...high flow events are mentioned as problematic for both capping and removal alternatives, but should also be identified as potentially detrimental to MNR. High flow can cause scour, disturbing and making biologically available the contaminated sediments."

EPA agrees that high flow events can also be problematic for MNR, especially when MNR relies on burial of contaminants. That is why monitoring after specified high energy flow events is an important component of the monitoring plan and will be required as part of the implemented MNR for Segments 4 and 5. Again, a final cleanup decision for all Segments of the Tittabawassee River will be made after monitoring data on the implemented NTCRAs are generated and analyzed; and an assessment of any remaining site risk is conducted.

21. ESC made a number of comments on Response Proposal, Section 3.5.1 "Segment 1 and 2 Benthic Community Conditions." Since there are no specific benthic community data from Segments 3, 4, or 5, ESC questioned the appropriateness of extrapolating from Segments 1 and 2. ESC also question some of the conclusions about the Segments 1 and 2 benthic community. Last, ESC made some comments potential dioxin toxicity to benthic invertebrates and recent research the mode of action.

EPA also has concerns about the conclusions about Segments 1 and 2 benthic community conditions in the Response Proposal. EPA stated as comment #5 in an August 29, 2016, letter to Dow approving the Response Proposal "*Benthic Community – Section 3.5.1 contains a brief*

*discussion of Segments 1 and 2 benthic community conditions. The Agencies are not “approving” this analysis. There is some uncertainty about how representative the sampling locations were and, as noted, no sample locations were included in Segments 4 or 5. Other biological receptors (e.g. fish, birds, reptiles, amphibians) will need to be considered for the ecological risk assessment.” In the future there will be a risk assessment that looks at residual risks for both human and ecological receptors in all Segments of the Tittabawassee River. We expect to evaluate potential impacts to benthos in that assessment. For detailed information about the current understanding of benthos in the system, the *Benthic Community Study Report* that can be found at <https://semspub.epa.gov/work/05/409599.pdf>.*

E. DIOXINS AND HEALTH

22. Two commenters feel that the Site has adversely affected their health and the health of their families. One of these commenters said that they left their property because of this.

EPA and MDEQ are sorry the commenters and their families have health concerns. EPA and MDEQ work with health agencies such as the Agency for Toxic Substances and Disease Registry (ATSDR) and the Michigan Department of Health and Human Services (MDHHS) to understand potential health effects to people from environmental contamination. The commenters have been provided contact information for MDHHS and ATSDR if they are interested in discussing health concerns with those agencies.

It is extremely difficult to attribute health effects causation to environmental exposures. ATSDR and MDHHS have completed a number of health consultations for the Site that can be found at <http://www.atsdr.cdc.gov/HAC/PHA/HCPHA.asp?State=MI>, including:

- 8/12/04 Health Consultation, Tittabawassee River Floodplain Dioxin Contamination, Tittabawassee River, Midland, Midland County, Michigan
- 4/29/05 Petitioned Health Consultation, Dioxins in Wild Game Taken from the Tittabawassee River Floodplain South of Midland, Midland and Saginaw Counties, Michigan
- 11/1/07 Exposure Investigation Report: Dioxin Exposure in Adults Living in the Tittabawassee River Floodplain
- 2/4/08 Health Consultation, Evaluation of Saginaw River Dioxin Exposures and Health Risks, Saginaw River, City of Saginaw, Saginaw County, Michigan
- 8/19/09 Health Consultation, Dioxin Contamination on Residential Property in the Tittabawassee River Floodplain, Saginaw County, Michigan

23. Two commenters expressed concerns with people’s consumption of contamination in fish from the river.

EPA and MDEQ recognize that potential exposures from consumption of local fish is an important pathway to consider and we encourage people to follow the fish consumption advisories found online at

http://www.michigan.gov/documents/mdch/EAT_SAFE_FISH_IN_THE_SAGINAW_BAY_AREA_WEB_356929_7.pdf. Additionally, EPA provides grant money to MDHHS and local partners to provide education and resources to the community about safer fish choices and better preparation methods

to help reduce exposures. The grant supports activities such as advisory signage that has been placed at many of the public access areas, a Fish Walker program, and broad distribution of the *Eat Safe Fish* information brochure. As noted in response to comment 1, the Segments 4 & 5 cleanup is expected to control the potential that the SMAs and BMAs act as ongoing sources of dioxin/furans to the river sediment. Controlling sources should result in lower river-wide sediment levels over time. These lower sediment levels should result in lower uptake into fish. Dow is monitoring contaminant levels in fish tissue over time. We will share that information with MDHHS to see what changes to the fish consumption advisories, if any, are warranted.

F. COMMENTS ON THE FLOODPLAIN

24. One commenter expressed concerns that his floodplain property will not be cleaned up and stated that he was being directed by Dow as to how he could use his property.

In 2015, EPA, after a public comment period and in consultation with MDEQ, selected a cleanup plan for properties along the Tittabawassee River. We are focusing on properties in frequently flooded areas, known as the 8-year floodplain. Not every floodplain property will need a cleanup because contamination is not distributed evenly throughout the 8-year floodplain.

EPA and MDEQ developed cleanup numbers in order to determine where cleanup is needed in the 8-year floodplain of the Tittabawassee River. Properties that have dioxin levels lower than the cleanup number require no further action under this program. If dioxin levels are higher than the cleanup number, that property will be eligible for a cleanup, and Dow will contact the property owner to offer a cleanup. It is expected that Dow would secure permission from the property owner before initiating cleanup on eligible property.

In some cases, the current owner or a previous owner may have voluntarily elected to place land-use agreements on the property, such as the Tittabawassee River Conservation Program (TRCP), which are enforceable agreements about land use. Current owners are expected to comply with the terms of these property use agreements. Dow, as well as EPA and MDEQ, have authority to enforce the TRCP land use agreements. Dow does not have authority to direct owner how to use their private property beyond the arrangements made in these enforceable land-use agreements.

25. Two commenters suggested that a seawall be installed with a height above the 100-year flood level, to prevent erosion and flooding.

Federal, State, and local laws and regulations would prohibit such flood proofing alterations to property in the Tittabawassee floodplain. However, EPA will evaluate TEQ concentrations on the Tittabawassee River floodplain properties to determine where action is warranted, pursuant to EPA's January 8, 2015, Floodplain Action Memorandum.

G. MISCELLANEOUS COMMENTS

26. One commenter felt that Dow should pay the property owners along the river "for what they done."

EPA does not have regulatory jurisdiction over whether people are compensated as a result of their property becoming contaminated. EPA is responsible for making sure that environmental laws and regulations are implemented so that public health and the environment are protected. Questions regarding whether compensation for damages related to contamination are appropriate are typically answered in the context of court actions not involving EPA.

27. One commenter believes that Dow is continuing to release contaminants to the Tittabawassee River. A second commenter said he had heard that Dow is continuing to release chemicals.

At this time, the State of Michigan regulates discharge from the Dow Midland Plant to the Tittabawassee River by permit, with strict, protective discharge limits and monitoring requirements. Prior to any discharge, water from the Midland facility goes through a tertiary wastewater treatment plant.

28. One commenter disagreed with the previous response action at Island MM, and said it "was a joke."

In 2011, EPA, in consultation with MDEQ, proposed and finalized a response action for Island MM, a small eroding island with elevated dioxin/furan. Prior to selecting the Island MM remedy, EPA conducted a public comment period from April 22 through May 22, 2011, held an April 28, 2011, public meeting regarding the proposed action, and responded to public comments in the Responsiveness Summary attached to the Island MM Action Memorandum. Later in 2011, Dow completed the selected response action, removing the island and capping adjacent sediment. EPA provided Dow with notification of the completion of this action on July 12, 2012.

29. One commenter felt that he and his family should be relocated and his house torn down.

EPA has responded several times in the past to this comment and similar comments from individuals requesting relocation. A very detailed response can be found at comment # 13 in the Responsiveness Summary for Interim Actions for High-Use Floodplain Areas at the TRSR&B Site found as Attachment D to the Action Memorandum at <https://semspub.epa.gov/work/05/393980.pdf>

In summary, EPA's preference is to address the actual or potential risks posed by contamination by using well-designed methods of cleanup which allow people to remain safely in their homes and businesses. Because of CERCLA's preference for cleanup, EPA does not routinely consider relocation as a component of a response. There are specific criteria that must be met for either temporary or permanent relocation. EPA does not believe that the properties in the Tittabawassee River floodplain meet these criteria. However, if new information becomes available that indicates relocation should be reconsidered, EPA will reassess properties in the Site to evaluate whether relocations may be required in the future.

ENFORCEMENT ADDENDUM

HAS BEEN REDACTED – FIVE PAGES

ENFORCEMENT CONFIDENTIAL

NOT SUBJECT TO DISCOVERY

FOIA EXEMPT

NOT RELEVANT TO SELECTION

OF REMOVAL ACTION